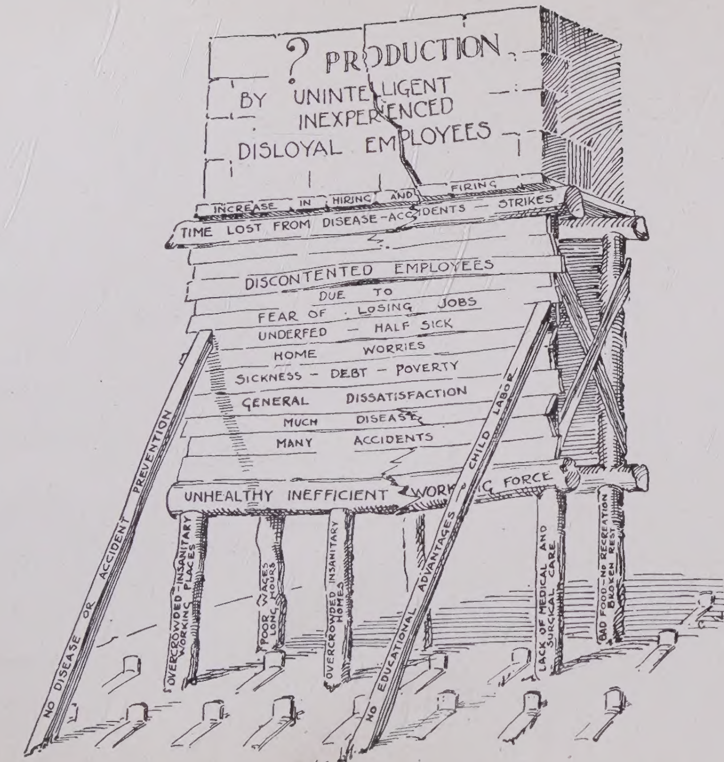
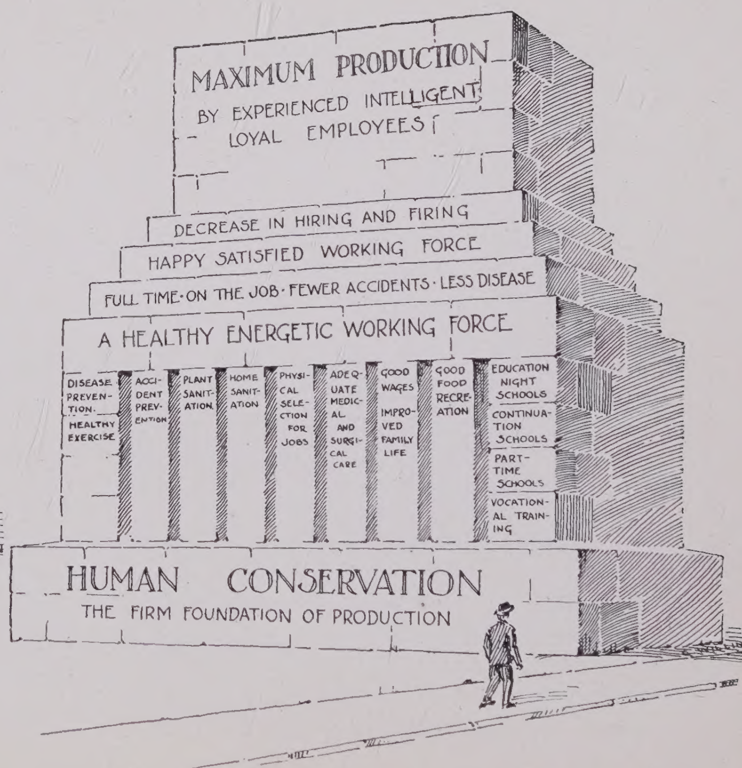


HUMAN WASTE
THE FOUNDATION OF PRODUCTION



INDUSTRIAL MEDICINE AND SURGERY

BY

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To

MARY MINERVA JACKSON MOCK

and

GOLDA TAYLOR MOCK

MY MOTHER

and

MY WIFE

This book is affectionately dedicated.

PREFACE

In presenting this book to the medical profession, and to those laymen interested in the subject, I am quite conscious of the fact that it is a deviation from the usual character of a text-book on medicine or surgery. Instead of dealing with the pathology, diagnosis and treatment of specific diseases or the individualistic practice of medicine, I have endeavored to set forth the reasons for, and the methods of a form of group medicine which has stood the test of years, and proven its practicability in many of the large industries of the country.

The conservation of the lives and limbs of the working people and the reclamation of those disabled in the daily strife have become a definite program in the industrial world. The humanizing influence of this work has caused many an employer to consider other means of contributing to the health, comfort and contentment of his working force. Wherever these principles have been adopted, the industry has been rewarded by greater efficiency among its employees, with a corresponding increase in production.

With the growth of this form of medicine the field has extended into the living and home conditions of the working forces, gradually resulting in closer co-operation with the public health authorities. In fact, it has become a vital factor in public health. To-day the achievements of industrial medicine and surgery are one of the strongest arguments in favor of a national health program.

It is less than ten years since the majority of leaders in our profession could see naught but a questionable future, a sort of lowering of the prescribed standards, for those physicians who entered the field of the company doctor. To the pioneers in this new specialty, however, it seemed that these industries offered a veritable human laboratory where the constant supervision of the health of thousands of employees would enable the development of a real system of preventive medicine and preventive surgery. It was their first glimpse of group medicine, a form of practice radically different from that taught in the medical colleges and learned during the one or two years of hospital interneship following graduation.

The comprehensive systems of industrial medicine and surgery established in many industries to-day were the result of a gradual development. The glimpse grew into a vision—the vision broadened with each subsequent year. No one man nor no one establishment can

claim the honor of creating this work, for a number of concerns throughout the country engaged competent physicians and surgeons who simultaneously developed these new principles in medicine.

The community of purpose drew together these physicians. By frequent consultations, exchange of ideas and experiences, and by the comparison of results, the vision of each individual broadened and the scope of the work expanded. It would be extremely remiss on my part to refrain from acknowledging with sincere gratitude the great assistance which I have received from many of the leaders, both medical and lay, in this work. Because of our close association, I am especially indebted to Drs. Otto Geier, C. W. Schereschewsky, Francis Patterson, W. Irving Clark, C. W. Farnum, Wilbur Post, Thomas Crowder, C. D. Selby, A. M. Harvey, and James Britton.

During a period of nine years as chief surgeon of one of the largest industries of Chicago, I kept careful notes of the development of this form of medical practice as well as complete records of the results obtained. For the last two years of that period I taught this new specialty to the students at Rush Medical College, where a night clinic on Industrial Medicine and Surgery was established. This afforded an excellent opportunity to study conditions in other industries lacking adequate health services. I am greatly indebted to my associates in this college work and especially to Dr. John Ellis, Dr. John Dodson, Dean of Rush Medical College, and Mr. John E. Ransom, Superintendent of the Central Free Dispensary.

This book endeavors to present these various experiences. It is based upon the practical application of every principle herein detailed not only in this one industry but in many of the other large concerns of the country. With the growth of this work of human maintenance in industry, it is becoming more and more apparent that our medical schools must correlate these broad social and economic principles with their teaching of medicine. Therefore, while it will be of value to those physicians engaged in industrial practice, it is felt that such a book will be especially valuable to the coming generation of medical students. As far as possible highly technical language has been avoided in order to extend its usefulness to the layman—to those employers, industrial engineers, social workers, and labor leaders who are honestly striving to improve the condition of those who must produce and provide.

To those pioneer industries having the foresight to establish and stimulate the growth of a genuine health service among their employees, the world is everlastingly indebted. Physicians working in this field could have made little progress without the moral and financial backing of these employers. No one realizes this better than the author.

The opportunity of publicly acknowledging this fact cannot be resisted. For all that has been accomplished in their medical department, the greatest credit must be given to the present management of Sears, Roebuck & Company.

To the ten doctors and twelve nurses on their medical staff, I wish to express my deepest gratitude for their loyalty and co-operation during these years of serving together. I am especially grateful to Dr. Edward A. Oliver, my associate for seven years, and to Miss May Middleton, the Superintendent of nurses, both of whom have rendered invaluable assistance.

A number of my colleagues in other industries have been unusually generous in furnishing data and other material and every effort has been made to properly accredit these and all other references.

To the publishers and those others who have so willingly co-operated in the preparation of this book, I will always be exceedingly grateful.

HARRY E. MOCK.

122 S. MICHIGAN AVE.,
CHICAGO, ILL.,
August, 1919.

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CHAPTER I

HEALTH SUPERVISION

EMPLOYEES' SERVICE DEPARTMENTS

Industrial medicine and surgery, the new specialty, deals with the human maintenance problem in industry. Our modern industrial concerns have regularly employed experts to study their expensive, complicated machines in order to preserve their mechanism and obtain their maximum efficiency. The human machine alone has been neglected.

It is true that company surgeons have existed for many years but rarely did the scope of their work extend beyond the repair of injuries. This new specialty in medicine not only furnishes adequate medical and surgical care when necessary, but includes all measures bearing upon the health, welfare and working ability of employees.

Supervision of Health of Employees has become an essential part of the organization of many large industries. The past decade has witnessed the birth, in this country, of this one of the most important of human conservation movements, and the last four years have seen it expand into a great, live issue with far-reaching influence. Since its birth, many other issues offering service to the great mass of wage-earners have been created. Chief among these are the Mutual Benefit Associations, the Safety Movement, and Employees' Compensation Acts. The latter still is an ugly child in many respects, but gives promise of a great future. Its brothers, Employees' Health Insurance, Old Age Insurance and Insurance against Non-employment have not as yet been born, but this new specialty is rapidly demonstrating their need.

A comprehensive system of the supervision of the health of employees must include every branch of preventive medicine and surgery and of remedial medicine and surgery, as well as industrial hygiene and sanitation. These are primarily medical functions and must be administered by the medical department of an industry.

Many other activities have been developed in our best organized industries, however, which have a direct bearing on the comfort, convenience, and state of mind of the employees, and therefore have the closest relationship to health supervision. Recognition of this fact has caused the creation of Employees' Service Departments in several concerns.

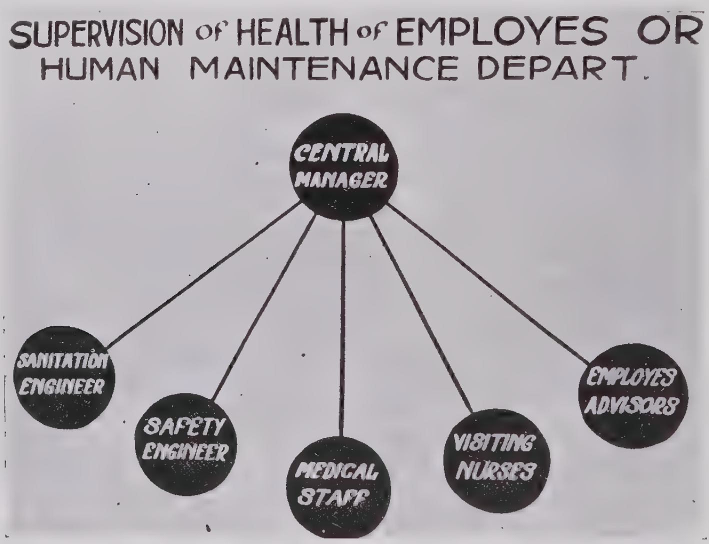

Fig. 1.—A successful plan of organization in one industry.

Usually a broad-visioned business man, or occasionally a trained sociologist, has been placed at the head of such a department. It is his duty to co-ordinate all these activities so that the greatest service will be given to the employees. The actual work of the medical department is under the doctor, the safety work is under the safety engineer, the employment manager attends to employment. In other words, the functions of these various services are decentralized as to activities but are centralized under one head as to policy, administration, etc. (Fig. 1).

In at least three large concerns all these functions have been placed directly under the supervision of the chief of the medical staff. The argument in favor of this is that the broadly trained physician, with a proper economic and social sense, because of his close relationship to the employees, is the best manager for such a department.

Time alone will prove which is the best plan. The tendency to give more and more power to the medical director is growing, and certainly demonstrates that all things which increase the health of employees must increase dividends to the employer. It also demonstrates that the vision of the physician in industry must constantly expand, and he must become fully cognizant of those activities which can well be called the adjuncts to health supervision.

This fact is positive, namely, all activities which deal directly with the health and safety of the employees should be placed under the medical director, and those functions which look to the comfort and welfare of the employees, although administered by various lay managers, must be closely co-ordinated with, and often supervised by the health department. In fact, everything about the industry which in any way touches the health problem should be subject to the approval or criticism of the medical staff if the greatest benefits from such a system are to be obtained.

What are the activities of an Employees' Service Department? From a medical standpoint they can be divided into those services which deal directly with health supervision, and those which are adjuncts to health supervision, as follows:

1. Health Supervision of Employees:
   (*a*) Medical Service.
   (*b*) Surgical Service.
   (*c*) Dental Service.
   (*d*) Nursing Service.
   (*e*) Safety Service.
   (*f*) Sanitation Service.
2. Adjuncts to Health Supervision:
   (*a*) Employment Service.
   (*b*) Restaurant Service.
   (*c*) Recreation Service.
   (*d*) Welfare Service.
   (*e*) Insurance Service.
   (*f*) Banking and Loan Service.
   (*g*) Housing and Community Service.

To the internist, surgeon, or the regular family physician, it is quite evident that this new type of physician, working in industry, is confronted with many problems which have not been included in the usual medical curriculum. Let me assure you, however, that all these services in the working homes of your patients have a decided bearing on their health. Recognition of the relationship between conditions in industry and the health of the people will become more and more essential in the teaching of medicine in the future.

Details of this work—the general principles, the purposes and the results of all the functions of industrial medicine and surgery, will be given in subsequent chapters. This discussion will be limited to outlining the scope of health supervision. I want to emphasize that the plan of supervision which I am about to offer is the ideal for which all company surgeons should strive—an ideal to which no industrial concern as yet has fully attained.

The prevention of sickness, accidents and inefficiency among employees is the purpose of all forms of health supervision. A general survey of the component parts is the first step in prevention, be it prevention of fires, accidents, burglaries, war, flood, or what not. Thus, the first step should be a general survey of the working place; the mechanical appliances therein; the employees, individually and in a group; and even the employers and their attitude and state of mind toward supervision of health. The physician entering an industry where this work has not been in vogue will usually have to develop this proper mental attitude on the part of both the employer and the employed.

MEDICAL SERVICE

The medical service in a properly conducted health supervision plan, includes those activities dealing directly with the equation of health in the employees and the treatment of their diseased conditions.

One of the first requirements in the general survey of this field is the complete **physical examination** of every employee, and, when practicable, a periodical re-examination of these employees, approximately every six months. I qualify the re-examinations, because, whereas in a plant employing only a few hundred people this can be done with a very small medical staff, in one employing ten or fifteen thousand people it would take a staff of four doctors doing nothing else to re-examine the force every six months. Such a plan would interfere with the work of the employees to the extent that few managements would consent to this unusual precaution.

The medical examination should be complete in every case, both male and female. The history in each case can be obtained by a trained nurse, who can also take the temperature, pulse, height and weight of the employee before he is sent in to the doctor. The physical examination can be made while a qualified laboratory assistant is analyzing the urine, the specimen being obtained just before the employee is sent to the examining room. Next, the dentist and the nose-throat-and-eye specialist examine the individual in turn.

Provided plenty of office space is available and sufficient and efficient assistance is given, this examination can be completed in 25

minutes. This includes the time necessary for disrobing and dressing again, and the short wait for his turn. Unless some condition is found which requires careful study, this examination need not take over ten minutes of any of the doctors' or nurses' time before whom the employee appears for each step in his examination.

Many times a day individual cases will present themselves which require considerably more of the doctor's time; for instance, certain diseased conditions must be carefully explained; advice applicable to each case must be given; the doctor must ascertain if the proper line of treatment is being followed in a certain case, and, if not, must arrange for it; questions must be taken up with the employees' manager pertaining to change of work, etc.; matters of personal hygiene must be discussed; and numerous other factors dealing with the personal equation between the doctor and the employee must be met and carefully considered. In no instance should this medical supervision attain such a high plane of efficiency, as regards speed and the number of employees examined per day, as to lose sight of this personal element—the benefit of the personal contact of the employees with the doctor.

Many company physicians may object to such a thorough physical examination of employees as is here outlined, but, remember, this plan is based upon the assumption that the industry wants the same efficiency in its human maintenance department which it demands in all other departments, and efficiency means thoroughness. The inspection of employees and choosing only those for physical examination who seem below par is better than no medical supervision; the physical examinations usually made on girls, namely, the head, neck and chest, have given wonderful results in supervising the health of these female employees, but to obtain the maximum of results a complete survey of the entire body of each individual is necessary in order not to overlook anything which might be detrimental to health.

The purpose of a complete physical survey must not be to eliminate the unfit from the working force, but must be done absolutely from the standpoint of supervising the health of the entire group. Thus, it is essential to ascertain the condition of health of each individual to discover diseases in the earliest stages, while still curable; to find anyone suffering from a communicable contagious disease, and to seek out the employee chronically diseased yet still able to work and recommend for him a position where he can be efficient without hastening the course of his disease.

Until such time as the State takes up its burden, employers should make adequate provision to render proper medical care and sufficient financial aid to him who is forced to stop work because of this system

of supervision; otherwise, the very purpose of such a system will be defeated, namely, the restoration to health in the shortest time possible. Lack of money and the worry over debts are great drawbacks to the regaining of health.

Of equal importance with the medical examination and re-examination of the old working force is the thorough examination of every applicant for work; in fact, this is just as essential as keeping the working place sanitary when once you have removed all unsanitary conditions. The examinations of applicants, however, should not be made for the purpose of choosing only the strongest, healthiest workers, but to protect the old working force from any applicant who might have some contagious disease. An excellent means is also given for supervision of the health of these prospective employees by preventing those with serious diseased conditions from going to work, for their own protection; and by choosing the proper type of work for those with chronic diseases which do not totally unfit them for employment.

I have talked with two national labor officials, and they assure me that if all industries would approach this procedure from as humane a standpoint, as above outlined, they would thoroughly endorse the plan.

Medical treatment of diseased employees is still a mooted question.

The treatment of conditions directly the result of occupations, for which the employer is considered responsible, is almost universally recognized as a logical part of the work of the company surgeon; but the care of the workman injured outside the plant, or whose sickness has no connection with his work rightfully belongs in the opinion of many to the family physician. To give the best results to both employees and employer, complete remedial measures must go hand in hand with the work of investigation and supervision.

This medical and surgical treatment has already been instituted in a few industries, and the results are proving its worth. Most medical staffs furnish complete surgical care to those injured while at work and the more rapid recoveries, fewer permanent disabilities, and lower death rate furnish the strongest arguments in favor of such a plan. Every company surgeon has seen the most deplorable surgical treatment given to workmen injured while at home. Many of these home accident cases are neglected by the employee himself until some severe infection or other complication finally forces him to consult his family doctor. Even then, many family doctors, untrained in emergency surgery, will give inadequate treatment, for example, making a small incision in an infected area when a wide-open incision is indicated. As a result, the disability of the outside accident case is often prolonged and frequently a permanent deformity occurs which could

have been prevented by the prompt, early treatment of the accident by the surgical mechanism of the industry. Many surgeons are daily interfering in the care of some home accident case in order to prevent these dire results.

Almost the same situation exists in the medical cases. When a diseased condition is found, the employee is advised as to the best line of treatment and then is referred to his family physician. Often he receives the very best of care from the latter, again only mediocre care, and occasionally he neglects to follow the advice to consult his doctor, waiting until the condition becomes so serious that he is forced to do so. In many instances the case is treated without any effort at a diagnosis being made. Time and again a blood examination or a stomach analysis would show the true state of affairs and would indicate the proper line of treatment, whereas the employee is taking pills from a "blind doctor," or is receiving electrical treatment from a quack.

Daily the medical staffs of industries are interfering in the treatment of sick employees. They are operating more and more on employees who have some surgical condition, when careful inquiry shows that they cannot afford to obtain proper surgical and hospital care, or when it is apparent that the condition is being neglected by the family physician.

A few industries have assumed the care of all cases of tuberculosis found among their workmen. Most of these are sent to sanatoria. Some refuse this care and choose home treatment under the family physician. A comparison of the results between this home treatment and sanatorium treatment proves that these concerns have saved lives by taking complete charge of the tuberculous employees.

Some industrial medical staffs are now treating all syphilitic and gonorrheal cases, with the result that scientific care is curing the early cases, and, best of all, society is protected. The old plan of firing the venereals and leaving many of them to the mercy of the quack is no longer practiced.

Those with defective vision are now being cared for by competent ophthalmologists, instead of allowing the employee to go to the corner optician for their glasses. In 1915 the writer found 799 cases of defective vision, and cared for 179 of these, the remainder going without care or to whomsoever they saw fit. In 1916 he found 1014 cases of defective vision and corrected 930. Supervision of these shows that they have remained corrected, and the increased efficiency resulting therefrom has far more than paid for the cost of this service.

These examples therefore prove that, hand in hand with the supervision of the health of employees, there must be proper medical and surgical treatment rendered—the two are almost inseparable. I

do not mean to insinuate that the medical men of an industry are better physicians than the average family physician, but I do know that systematic care by a unit of medical men, each trained especially in some particular line, will give the surest, quickest and best results.

NURSING SERVICE

One of the chief aids in the supervision of the health of employees is a well-trained staff of industrial nurses. Special training is necessary before any nurse can learn all the ramifications of the work of an industrial nurse. Through her the employers can show their friendly interest in the force. The small merchant, with five or six employees, can personally visit and offer aid to one of his men when the latter is sick or in trouble; but the large employer, with several thousand workmen, must depend upon some other agency in order to show his friendly interest in their welfare.

Thus, every industry should have a sufficient number of these nurses to visit each sick employee; to render nursing aid when necessary; to report on his condition and whether or not he is receiving proper medical care. She also diplomatically ascertains whether or not financial aid is needed; if the sick one is worrying over accumulating debts; if the home environments and housing conditions are such as to interfere in his rapid recovery; in fact, she is able to supervise the health of the employee, to a certain extent, while at home.

SURGICAL SERVICE

The Surgical Service is one of the most vital branches of the medical department. The company surgeon, working in the front line trench of industry, is in the strategic position to develop the most comprehensive system of preventive surgery. His first duty is to study and enforce every possible form of accident prevention. In the minor accidents, such as pin-pricks, bruises, and the like, which are almost unavoidable, he must devise means of preventing complications such as infections. When an accident occurs he must be close at hand to render the earliest possible treatment, and must continue to treat the case from the standpoint of preventing undue loss of time from work, preventing permanent disability, and, above all, to prevent the death of the patient. The restoring of the most perfect function in an injured member must be his aim. Such a surgeon is constantly striving for the best economic-end result, as well as for a medical-end result.

Every industry should have on its medical staff a surgeon competent to handle every type of surgical condition. Even where a

specialist is required for certain operations this company surgeon should continue to supervise the treatment. Employees sent to a hospital for surgical care usually receive more prompt attention and more careful after-treatment from the surgeon who is directly responsible to the management of an industry. Many an employee has been referred to one of the large hospitals in a city for operation when his occupation was not responsible for the condition. Often three or four days elapse before the hospital surgeon finds time to operate, except, of course, in very acute conditions. After the operation the treatment is left largely to the interne. Unfortunately, many internes have not yet developed the proper social sense, or do not consider the great economic loss due to keeping the patient in the hospital longer than is necessary. These employees leave the hospital dissatisfied with the treatment which they have received. Their statements are often exaggerated, but nevertheless it is apparent to the management that the cases cared for by the company surgeon are expedited, while too often those referred to the general staff of a hospital sustain an unnecessary loss of time. This condition is resulting in the company surgeon being requested by the management to operate more and more often on workmen with conditions other than injuries, especially when the early return of a man to his work is vital to the production of the plant.

In many industries the workmen are so scattered that it is often impossible for the surgeon to render prompt treatment when an accident occurs. In this case he must arrange for proper first-aid treatment by some competent fellow-employee. First-aid stations in some plants have been established at regular intervals throughout the buildings with trained laymen in charge to render first-aid to every injured employee. In others three or four intelligent employees are chosen in each department and are carefully drilled in every form of first-aid treatment by the company surgeon. When an accident occurs in that department these men take charge of the case and render the early treatment indicated. This first-aid work, however, should never replace the doctor. Practically every injury, no matter how slight, should be sent or taken to the central office at once where a competent surgeon can take charge. In many places this first-aid service has been developed to such a high degree that it is one of the most important features in their plans for health supervision.

SAFETY SERVICE

No system of supervision of health of employees is complete unless suitable provision is made for the prevention of accidents. Therefore, a safety engineer is essential in making the general survey of mechan-

ical conditions of the working place and in adding every appliance known for protection. After this is done he must make daily inspections of the plant to see that these safeguards against accidents are used by the employees. He must also investigate every accident in order to devise some means to prevent its recurrence.

There must be the closest co-operation between the safety engineer and the company surgeon; in fact, he should be directly connected with the medical department. The surgeon must report every accident promptly with all data pertaining to its cause which he obtains from the injured employee. By talking freely with an injured man during the period of caring for him the doctor can learn many apparently insignificant facts, even from the most ignorant employee, which are invaluable in this work of prevention. Likewise, the company surgeon is the safety engineer as regards the human mechanism. By thoroughly examining the injured man he often finds some physical or mental defect as the cause for the accident.

SANITATION SERVICE

Sanitary conditions of the plant have a very definite bearing on the comfort and health of the employees. Industrial engineers are constantly pointing to the relationship between industrial sanitation and maximum production. There is no doubt but what unsanitary conditions about a plant cause more sickness, more discontent among the employees, greater labor turn-over, and a very definite slowing up of production. From a medical standpoint the sanitary inspections are almost of equal importance as the inspections of the force by physical examinations. The medical staff should see that every unsanitary condition is removed and the plant is made as healthful and comfortable as possible. To accomplish this the cleanliness of the building, the ventilation, the lighting, the temperature and humidity, the disinfection of toilets and cuspidors, the installation of proper washing and bathing facilities, the removal of dangerous gases and dusts and the fumigation of departments or rooms where contagious cases have developed must be made perfect and kept so by frequent inspections.

EMPLOYMENT SERVICE

The question may well be asked by those unfamiliar with this work, why the employment service should be included as an adjunct to health supervision. The very fact that some employment managers in certain industries are endeavoring to have the medical departments placed under them demonstrates that there must be a very definite

connection between health and employment. But the employment problem is only a small portion of the health program in any industry, and it is bound to curtail the work of the medical department if it is made subordinate to the employment department. As a means of health supervision it would be more logical to place employment under the medical director. The majority of concerns, however, consider it best to have the closest co-operation between these two departments, but to have them operate under separate heads.

Every applicant for work should be thoroughly examined by the medical staff in order to prevent the introduction of contagious diseases into the plant and to provide for the proper selection of work for every man according to his physical and mental qualifications. The employment department should see that the recommendation of the doctor as to the type of work a man is qualified for is carefully followed.

In many concerns the employees are no longer subject to the whims of the foreman. The studies in labor turn-over have revealed the fact that the employing and training of a man to the point where he is efficient is too expensive a proposition to warrant his careless discharge unless there is a very good reason. In most of these concerns no employee is discharged without the approval of the employment manager. The latter ascertains why the man has not made good on his job, and sees if there is any other position in the plant in which he could make good. The medical department has become one of the most important allies in these efforts to conserve man-power. Frequently some incompatibility between the occupation and the physical condition of the employee is responsible for his failure to succeed in a given position.

The earliest impressions the new employee receives concerning his future working home are received in the employment and the medical departments. Both should endeavor to at once familiarize the new man with every branch of the employees' service department. These first impressions go a long way toward engendering in the novice the proper mental attitude toward his future work and his employer.

RESTAURANT SERVICE

Many industries provide proper restaurant service for their working force, or at least a proper place in which to eat their lunches. No group can be kept at the highest point of efficiency if allowed to remain in the department during the noon hour. The change from the working place to a suitable eating place, with the short walk in the open air which this should involve, is one of the best efficiency measures which any concern can adopt (Fig. 2).

The providing of the proper food for employees, the supervision of the sanitary conditions of the restaurant and the physical examination of the help preparing or serving this food is a logical part of the health supervision program.

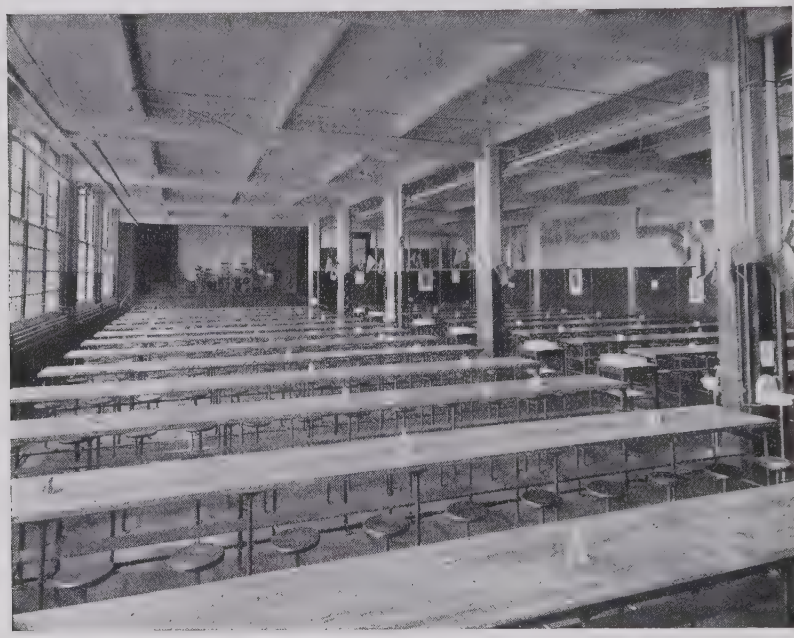

FIG. 2.—Employees Dining Room. (*Courtesy Cincinnati Milling Machine Co.*)

RECREATIONAL SERVICE

Athletics has become almost as popular among industrial employees as among college students. Almost every small concern, as well as the large ones, has its baseball team, its tennis team, and even its golf team. Competitive games between different working forces are quite frequent. Some of the largest industries have their athletic directors and employ coaches similar to the athletic departments of universities. Teams are developed in the different departments and competition is very keen. The annual field meet of one of the large industries of Chicago now attracts almost as large a crowd as the Conference Meet at the University (Fig. 3). These athletic contests are not limited to the male employees, but the girls have their teams and tournaments likewise.

No better means of improving the physical condition of employees and of supervising their health can be established than this form of recreation. The doctor should take a very active part in all such organizations and should constantly stimulate the employees to

join some one of the athletic teams, or to join the gymnastic classes. In this industry, above referred to, no person can become a member of one of these teams or take part in any form of physical recreation

Fig. 3.—Annual Field Meet Homan Athletic Association. Colleges no longer monopolize athletics. (*Courtesy Sears, Roebuck & Co.*)

connected with the plant without first being thoroughly examined by one of the doctors and pronounced physically fit to compete. This affords another channel for health supervision.

WELFARE SERVICE

The term "welfare" is disliked by many employees. It smacks too much of charity. Nevertheless, it is one of the most important branches of the employees service department. It has been variously termed in the different industries as The Industrial Relations Service, The Employees Advisors, The Sociological Service, etc. No matter by what term you call it, the work of such a division has a logical place in industry, and it must have the closest connection with the medical department.

Many times little controversies will occur between a boss and a worker, or little injustices will be done an employee and will so prey on his mind that he first becomes mentally then physically unfit.

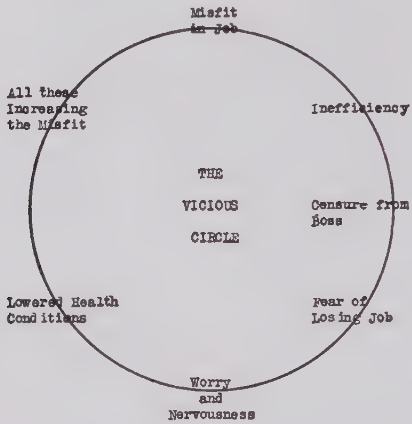

Fig. 4.—All things tending to lower the health of an employee lower his efficiency. Result—The Vicious Circle. The preventive is a properly organized Human Maintenance Department.

Again, misfits between the job and the man, misfits in temperament between the boss and an employee, and many other allied conditions, often lead to the development of a vicious circle. A misfit means inefficiency, inefficiency causes censure and fear of losing his job, this fear causes worry, then nervousness, then lowered health conditions, and this last physical state makes him a greater misfit (Fig. 4).

Fears of all kinds; discontent; lack of living wage; worry over sickness or trouble at home; worry over debts; over a love affair; over a crime committed; bad habits, especially intemperance; bad home environments; insufficient food; unsanitary housing conditions; and innumerable other stimuli for mental and physical depression, are daily arising to undermine the health of employees. It is just as essential to remove these conditions as it is to make the plant sanitary.

The ability to meet these problems and to help the medical department to solve them is the duty of the so-called welfare department. Let the employees know that their confidential friends are located in this department—a sympathetic man for men, and a woman for women—where they can take every problem of the above nature and receive help. In a large industry these advisors furnish an excellent means of personal contact between the employer and employee—a personal contact which is essential to the comfort and well-being of every worker. This department is responsible, to a large extent, in educating the force to co-operate in all plans for accident prevention and health supervision.

INSURANCE SERVICE

The need of some form of health insurance for sick employees is clearly demonstrated by the fact that most large industries have provided mutual benefit associations to which the employer in most cases contributes a certain amount as well as the employee. The insurance thus received in case of sickness enables the workman to secure proper medical care. In most concerns membership in these benefit associations is entirely voluntary. The medical staff, which is in the best position to realize the value of this form of insurance, should never miss the opportunity of urging the employees to join such associations. As a rule these organizations are a great stimulus to health supervision. Employees contributing to a benefit association are easily impressed with the saving which results from keeping the sick rate down to a minimum by proper preventive measures.

BANKING AND LOAN SERVICE

While the banking department of an industry, which provides for savings at a good rate of interest, may not have a very close connection to the problems of health supervision, yet the loan department of this banking service has one of the closest connections. Time and again the visiting nurses will report that an employee who is at home sick needs special nursing service, or that the home conditions are responsible for the ill-health, or that an operation requiring the expenditure of a considerable sum is necessary, and that funds to meet the situation are lacking. After a careful investigation the medical director can recommend to the banking department that a loan of money be granted such an employee. As a rule these loans are repaid in very small amounts from the weekly wage after he is able to return to work.

In one industry advantage has been taken of this loan privilege to urge employees to have much needed dental work done. This

same concern has arranged for all old employees, and all applicants for work who are accepted, who are in need of glasses to correct defective vision to buy the same, the money being provided by a loan.

HOUSING AND COMMUNITY SERVICE

No system of health supervision in the plant is complete that does not consider the home conditions of its employees. The best means of securing reports on these home conditions is through the visiting nurses. Close co-operation with the Municipal Public Health Service will enable the medical director to secure the necessary correction of unsanitary conditions in the community.

If the head of a concern, or a man very close to him, will take charge of this service and will take an active interest in improving the housing conditions for the entire community as well as for his employees, the greatest benefits will result.

From this short résumé of the functions of the various services represented in a complete Employees' Service Department, it is quite evident that the supervision of the health of the employees forms the very foundation of all this work.

Before such a comprehensive system of supervision of the working place, the mechanical appliances therein, and of the employees, can be instituted the employers must be educated to the value of such a procedure. Some employers, with a vision and a social sense, will see the humane side, while others, of a more calculating disposition, will look for the dollar-and-cent value before installing this system.

In those industries where pioneer work in Industrial Medicine and Surgery has been done, the results should satisfy either of the above types of employers that such supervision pays dividends and makes a happier, more contented working force. It must be the duty, therefore, of every company surgeon, of every safety engineer, and of every so-called welfare worker, to show that *the benefits to the employer are in direct ratio to the thoroughness and completeness of the plan which he adopts for the Supervision of the Health of his Employees.*

Very few employers, even in industries where various plans of health supervision have been inaugurated, realize the reasons therefor and the full significance of this work. If they would awake to a real comprehension of the value of this form of supervision, a social evolution would occur which would react to the great welfare of both the employer and employee and would solve more labor disputes in a minute than the old system could evolve in a year.

This is *not* Socialism—so-called—but it is the broadest socializing influence, the most forward step for preparedness, and the greatest conservation movement our country has ever witnessed.

CHAPTER II

THE PLANT HOSPITAL OR DOCTOR'S OFFICE

The term "Doctor's Office" is usually applied to the medical department of an industry. In many places it has the functions, temporarily, of a hospital, but because a special license is required to operate a hospital and because patients are seldom kept at the plant over night, the term "hospital" is rarely used. In some concerns it is called the "Plant Dispensary," in others, "The Medical Department," and in one industry the sign "Employees' Doctor" marks the location of this department.

Every industry with a few hundred employees, as well as those employing thousands, will find it greatly to their advantage to have a

FIG. 5.—Industrial Dispensary at Primero, Colo. (*Courtesy Colorado Fuel & Iron Co.*)

medical department located somewhere about the plant. The smaller industries will not require a doctor all day, but there should be a doctor's office and a physician in attendance for a few hours every day. For industries of a thousand employees or more it is very imperative that there should be a plant dispensary and constant medical attendance. The duties of the physician will be taken up in the next chapter.

The location of the medical departments in those industries which have installed them varies considerably. Some have built very hand-

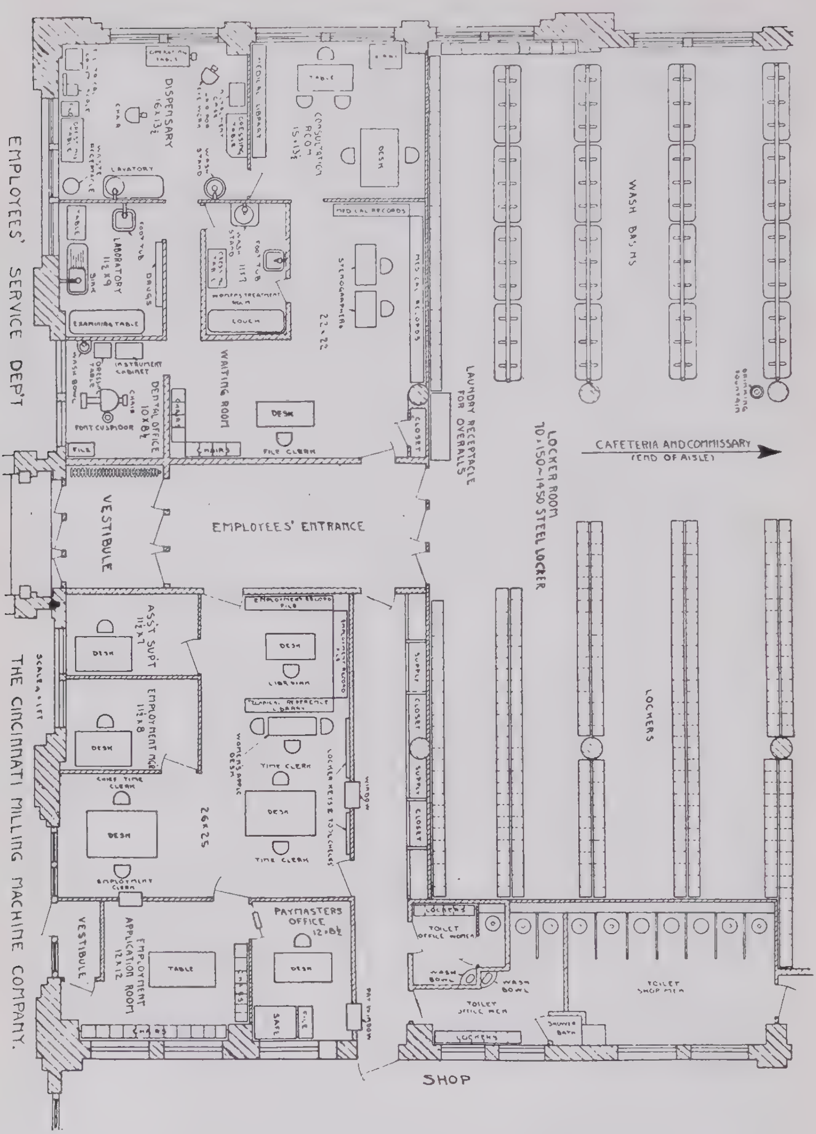

FIG. 6.—Medical Department and service room plan. Cincinnati Milling Machine Co. (*From "Employees Service News."*)

FOREWORD.—The two floor plans of the Employees' Service Department of the Cincinnati Milling Machine Company include some 23,000 sq. ft. of floor space, which is given over to the Medical, Dental and Employment Departments, the comforts and convenience of the locker room, the Commissary and the Cafeteria.

While the growth of this Department has been gradual, the whole layout is distinctive in that all of the facilities mentioned above have been brought together and centralized for the purpose of supervision and convenience and efficiency of operation. Considerable study is evidenced in its compact arrangement, providing everything that the human engineer would first think of, except, perhaps, recreational facilities.

Looking first at the office end of the Employees' Service Department one notes that the Employment Department and the Medical Department are side by side,

some buildings in close proximity to the plant (Fig. 5). Others have set aside spacious, well lighted rooms directly in the plant and equipped them as the most ideal doctor's offices, surpassing in many respects the private offices of any physician in the country. Many of these would delight the heart of the most fastidious physician.

Too often, however, the company physician has been unable to demonstrate the value of efficient medical service to his employers and as a result they have furnished him very poor quarters in which to work. Or the management may feel that the medical department is an unprofitable, expensive necessity and therefore crowd it into some place where it will not take up space capable of productivity. The best argument against this attitude is that some of the largest, most successful concerns have assigned the best location in their plants to their medical departments.

Some time ago a successful business man visited one of the progressive industries and made a careful inspection of their doctor's office. When he had finished he said: "This is all very fine but how can you afford to give over such a large amount of valuable space to your Medical Department?" The official of the concern who was present said: "Why, man, this department pays the biggest dividends of any of our departments and therefore it deserves all the space it needs."

The selection of the proper location for the doctor's office or plant dispensary must depend upon many local factors, but a few general rules can be laid down which should be of great assistance to the company surgeon.

1. Choose a central location in the plant where the doctor's office will be the most available to the greatest number of employees.

2. If one portion of the plant is engaged in work where accidents are more liable to occur, the office should be located in that vicinity.

3. Whenever possible the employment department should be in close proximity so as to facilitate the examination of applicants for work (Fig. 6).

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separated only by the employees' entrance, whose doors are locked at the starting hour. Thereafter all late comers must pass through the Employment Office, where the clerk makes record as to his cause of lateness. Similarly, all men leaving the shop at irregular periods can only pass out through the Employment Department and by the same clerk, who makes record of his exit. All successful applicants for jobs readily pass into the Medical Department for a physical examination.

After starting hours the doors leading from the locker room to the plant are locked. The floor arrangement shown indicates how accessible the Medical, Dental, Employment and Paymaster's Offices are to all the men of the shop. Complete privacy is assured any employee who wishes to discuss his personal affairs with the Employment Manager, the Assistant Superintendent, or the Medical Chief, who happens also to be the Director of the Employees' Service Department. It is here also that office room is provided for the group of men who manage the Health and Insurance Association of the plant.

The floor plan is practically self-descriptive and needs no further elaboration.

4. It should not be placed in a noisy portion of the plant where the rumble of machinery, or of heavy trucks, etc., will interfere with the efficient use of the stethoscope in examinations.

5. The rooms should be spacious, well ventilated and well lighted and of sufficient number that the work can be done with more or less privacy.

6. The doctor's office should at all times be a model of cleanliness.

7. Whenever the size of the industry warrants it the office should be located upon the grounds or in the building.

8. Keep the medical work centralized in one office as far as possible, but if the plant is scattered, it may be necessary to have substations.

9. Whenever practicable a separate building in close proximity to the plant should be used. This affords better light and ventilation and quieter examining and rest rooms. Sick and injured employees are also exposed to less unpleasant publicity.

The minimum requirements for the doctor's office in an industrial concern, suitable for conducting the medical examination of employees, can best be shown by quoting from the report of the "Committee on Factories," made to the Chicago Tuberculosis Institute in 1913.

This committee consisted of:

Dr. Harry E. Mock, Sears, Roebuck and Company, chairman.

Dr. A. M. Harvey, Crane Company.

Dr. James A. Britton, International Harvester Company.

Dr. W. H. Lipman, Swift and Company.

Dr. L. Z. Little, Western Electric Company.

"'Provision for the Medical Office and Equipment in an Industrial Concern' was the subject of the committee's report.

"That it marked an epoch-making advance in the promulgation of the systematic supervision of the health of employees, was pointed out in the words of the chairman of the Factory Committee, Dr. Theodore Sachs: 'The most significant point in connection with this report is that in a comparatively short period of three years or so, the medical departments in the industrial concerns became an important integral part of the concern and this report certainly presents a good basis for all others, who are contemplating the installation of a health department, to follow.'"

The committee report follows:

"In the judgment of your committee, the subject matter proposed for their consideration was entirely too broad:

"*First.*—Because a great many industries already have a medical department in connection with their plants.

"*Second.*—Because an industry planning to take up this medical work should first choose a competent physician to take charge, and

the arrangement, equipment, size and location of the doctor's office should be left to his judgment and discretion in practically every case.

"*Third.*—Because most industries contemplating the installation of a doctor's office must of necessity have in mind the care of injured employees as one of the chief duties of the medical department.

"Therefore, we have dealt with this subject from one aspect only, namely: 'What should be the minimum requirements for the doctor's office and equipment, in an industrial concern, suitable for conducting the medical examination of employees.'

"The ideal arrangement would be a group of offices, well-lighted, well-aired, removed from all noises, and housed in a building preferably detached from the plant, but conveniently accessible to a majority of the employees.

"There are now a few such ideal doctors' offices in connection with certain industries here in Chicago, but it must be remembered that it has taken years to accomplish this.

"It can hardly be expected that a medical department will be installed on such a grand scale before its value has been absolutely proven to an industrial concern.

"As stated before, most large industries already have a medical department in connection with their plant for the care of accident cases. These offices can be used at certain times of the day for the examination of the employees. As the value of this procedure, in the increased efficiency of the working force, is demonstrated, larger and better equipped offices will undoubtedly be established.

"For small concerns desiring to adopt a system of medical examination of employees, but where the installation of a doctor's office is not practical and space is not available, this can usually be accomplished by sending the employees to a doctor's office in the neighborhood; or a group of small industries can unite and employ a doctor who will visit them in succession. Every concern, no matter how small could give a small office to the doctor for an hour a day where he could conduct the examinations. The specimens for the laboratory work could even be carried back to this doctor's own office for analysis.

"For a concern contemplating the installation of an office for the purpose of examination of employees the following should be the minimum requirements:

"**Location.**—This may be directly in connection with the plant, but an effort should be made to choose as quiet a location as possible. Thus, noisy machinery overhead or in the adjoining room may detract to a certain extent from the value of the examination.

"**Offices.**—The size and number of these must depend upon the number of employees to be examined daily. For this reason, the

physician in charge should be chosen first and consulted freely as to his needs. The following rooms are necessary, however:

"A **waiting room** equipped with chairs or suitable benches for seating. A separate waiting room for men and women is a more ideal arrangement, but not at all necessary (Fig. 7).

"A **general office**: where a stenographer can work and where files can be kept. It is very essential that the most careful record be kept on each case examined (Fig. 8).

"**An Examining Room.**—This should be made as quiet as possible, should be well-lighted, even if artificial light is necessary to accomplish

Fig. 7.—Waiting Room.

this, and should be completely closed off from the rest of the rooms. It should contain a chair for the doctor, a stool (a revolving piano stool is ideal) for the employee, and a simple, padded examining table, for frequently it is desired to examine the employee in a recumbent position; also a small stand for writing or on which to lay the stethoscope, the blood pressure outfit or other instruments. Two hooks placed in the wall can be used as clothes hangers.

"If a number of employees are to be examined each day, two or more such rooms should be thus equipped. An ideal arrangement is to have a dressing room in connection with a small examining room. Two or more men can then remove their clothing in the dressing room and come into the examining room prepared for the examination. Thus, the doctor can remain continually in this room, examining the employees as they are brought to him.

"For examination of the female help, the separate dressing room and examining room is very essential. The girl employee should remove her waist and underclothing over her chest in the dressing room, and the nurse should then cover her chest and shoulders with a sheet or an

examination cape. The girl is then taken before the doctor to be examined. In all cases the nurse should be present when a girl is examined.

"**A History Room.**—This is not essential, as the history of each case may be taken in the examining room; but it saves a great deal of the physician's time if a separate history room is provided. Here, the temperature, pulse, height, and weight of the employee can be taken, and the few points desired in regard to his age, nationality, and past history obtained. This can be done by a nurse, or, if the nurse's time is occupied elsewhere, by a well-trained attendant.

Fig. 8.—Clerical and Filing Room in Doctor's Office.

"**A Laboratory.**—This is absolutely essential, for no examination is complete without certain laboratory tests are made. It should be equipped, therefore, for careful urinalysis with a microscope, blood counting, and blood pressure apparatus (Figs. 9 and 10).

"A **private office** for the physician in charge is desirable, where confidential conversations with the various employees may be conducted. In the absence of such an office, one of the examining rooms can be used for this purpose.

"As the medical examination of employees is such a broad subject and as there are so many problems to be considered, we would recommend that this organization appoint a permanent committee to meet with and co-operate with other committees, such as the Industrial Hygiene Committee of the Illinois Manufacturers Association, the Health Committee of the National Safety Council and the Health Committees of the various labor organizations who are also considering this subject of the medical examination of employees."

The above report covers only the essentials for a doctor's office, equipped for the medical examinations. In addition this office must have:

A **surgical room,** where the accident cases can receive immediate attention and where the subsequent dressings can be done. If the industry employs a large proportion of women, there should be two of

Fig. 9.—Laboratory in hospital of Colorado Fuel and Iron Co.

Fig. 10.—Laboratory in Medical Department. (*Ford Co.*)

these rooms. Good light and ventilation are very essential. They should be closed off from the rest of the office as the sight of wounds being dressed will tend to prevent employees from coming to the office.

Here above all places cleanliness must be the rule. The room should be white and furnished in white enamel (Fig. 11). Instruments, as far as possible, should be kept out of sight. The furniture should consist of:

(*a*) White enamel table where the patient can lie down if necessary.

(*b*) White enamel dressing table.

(*c*) White enamel stand for instrument sterilizer.

(*d*) Glass jars for the dressings.

(*e*) Instrument cabinet.

(*f*) The few necessary drugs.

(*g*) White enamel chairs or stools.

Fig. 11.—Surgical dressing room in Medical Department. (*Courtesy Ford Co.*)

(*h*) White enamel stands suitable for resting of leg or arm for dressing wounds of these extremities.

(*i*) Hot and cold running water (foot control).

(*j*) As an adjunct to this equipment there should be space, or preferably a separate room, for hydrotherapy and baking apparatus.

A **sterilizing room,** where all dressings used on the wounds can be thoroughly sterilized.

An X-ray Laboratory.—This is very essential in connection with every doctor's office where accidents of a severer nature are liable to occur.

Rest Rooms.—One for the women employees and one for the men should be provided in every industry and should be in connection with the doctor's office. Sudden acute illness among the employees will often necessitate their lying down until a cab or ambulance can be called to take them home or to the outside hospital. Likewise, a suitable rest room will enable employees to overcome some temporary condition and return to work after an hour or two. The value of these rest rooms will be touched on in subsequent chapters.

Proper toilet facilities must be provided in the doctor's office. Bath tubs in connection with these will frequently be of advantage. Cases of heat exhaustion have undoubtedly been saved by the immediate use of a tub of cold water. Again the nurses by keen diplomacy have persuaded employees, unused to a bath more often than twice a year, to enter these tubs and learn the joys of a good bath.

A dental office and rooms for eye, ear, nose and throat work are most valuable additions to this office and are necessary when a concern is sufficiently farsighted to see the great economic value of an efficient, comprehensive system of Industrial Medicine and Surgery.

When a small number of persons are employed it is unprofitable to have a medical department connected with the plant. In this case arrangements should be made with a nearby physician to render immediate care to their injured and to use his office for the purpose of making the medical examinations. This physician should visit the plant once or twice a week to make sanitary inspections and in other ways supervise the health of these employees.

In some cities several small employers have combined and selected a physician with a central emergency office convenient to all their plants to carry on this medical and surgical work for them. The point is that every employer should voluntarily assume this protection for his employees or the states should pass legislation making such a procedure compulsory.

CHAPTER III

THE MEDICAL STAFF

SIZE, DUTIES, AND ADJUNCTS

The character of the work, the number of employees, and the size of the industry must determine the number of doctors, the location of the plant dispensary, and the amount of service necessary to conduct a comprehensive system of health supervision. These are details which each company surgeon must meet, and which will certainly be subjected to changes with the growth of his work. For instance, one industry, a pioneer in this type of medical and surgical work, has gradually expanded its space, equipment and medical staff from a small four room office with one doctor and two nurses in 1909, to a large eighteen room office with ten doctors, twelve nurses, and two dentists in 1916. These doctors spend 3½ hours per day at this work, so rotating that there is always one or more in attendance at the company office.

While many expert company surgeons devote all of their time to the industries employing them, yet as a rule better-trained and more able physicians can be secured, if employers require them to give only a part of their time to this work. This perhaps would not be true if they would pay a salary commensurate to the services rendered by the up-to-date company surgeon. Industry should require the very best talent in the medical profession, but such men can make a much greater income in private practice. Undoubtedly the time is rapidly approaching when large salaries will be paid in order to engage the best medical and surgical talent in the country for this type of work.

However, an industry can employ two physicians of this caliber for part time service, and their combined salaries will be much less than if one of them gave his full time to the work. An additional incentive to a good internist or surgeon entering upon such an arrangement is the great amount of clinical material placed at his disposal. These medical departments of industries afford the greatest human laboratories for study ever offered to a physician.

The situation is quite analogous to that found in our leading medical schools. The heads of departments and those associated with them give a portion of each day to teaching and clinical work—the rest of their time is given to private practice, study and investigation. Because of their clinical experience, plus the broadening in-

fluence of their private and public work, these men become the leaders and scholars in our profession, and their influence in the community at large is much greater than if they devoted their entire time, on an inadequate salary, to teaching in a medical school. The tendency for medical teachers to give full time to this work is due to the willingness of a few Universities to pay an adequate income. But the best full time teachers are those who have had the experience and broadening influence of actually practising medicine previous to limiting their work to teaching. (Certain laboratory men and specialists are exceptions, of course.)

So with a company surgeon—the greater name and prestige he can build for himself in his community, the greater his value to the industry with which he is connected, and the better his influence over the employees and their confidence in him.

As stated before, the composition of the medical staff will vary according to the number of employees and the size of the industry. The sex of the employees also plays a part in this decision.

The first requisite is a well-trained medical man in charge of the work, known as the Medical Director or Chief Surgeon. He should always be a man, if the working force is entirely male or composed of both male and female help. In those concerns employing chiefly women a properly qualified woman physician will undoubtedly be of the greatest service. Where the amount of work demands it, one or more medical assistants must be employed. A nurse, preferably female, is the most valuable aid to the medical staff. Her duties are outlined in a subsequent chapter.

If the size of the plant warrants it, an oculist and dentist should be employed. At least arrangements should be made with some able oculist and good dentist to take care of this branch of the medical work at their private offices.

The medical man entering this field must be a very broadly trained physician. Some of the largest industries can afford to have several doctors on their staff and thus can divide the work into its various specialties; but even here the chief of staff must be trained thoroughly in all the branches of this work. In the smaller corporations, however, the company surgeon must be a surgeon, an internist, a diagnostician, a sanitation expert, and an all-around medical utility man.

The duties and size of the staff can best be illustrated by outlining specific examples in several typical industries.

I. A **stove factory** employing approximately 800 men. This factory has a one room doctor's office, well lighted, and equipped with sufficient surgical appliances and dressings to do all types of emergency surgery, as well as routine ambulatory dressings; a chair and table suitable for making medical examinations; a small but

practical and adequate laboratory. A physician, whose office is two miles away, is employed on a monthly salary by this concern. He is a general practitioner—a good internist and a good surgeon, and a man who keeps abreast of new developments in medical science. He visits the plant for two hours every morning.

His duties there consist of, dressing all minor accident cases; examining any new employees hired within the last 24 hours (he calls early in the morning and the concern tries to have all applicants for work examined before employing them); examining all employees who have been absent on account of sickness; examining a certain number of the old working force, so that those needing it will have their periodical physical examinations; and making the necessary sanitary inspections to properly supervise the health of all the employees.

One employee in this concern has been carefully trained in first aid work. All workers sustaining injuries, no matter how slight, are made to report to the doctor's office at once. Here, during the physician's absence, this first aid man applies iodine and a simple sterile dressing to only the very minor accidents and allows them to wait until the next morning before seeing the doctor. To the other cases he applies iodine and a sterile dressing and sends them at once to this physician's private office. Or, if the case is serious, the doctor is immediately called to the plant. He has two associates who are on call for these cases providing he is away from the office.

This physician has a similar arrangement with two smaller industries but calls only twice a week at their plants. Their accident cases are sent to his office for dressings, but all medical examinations are made on his calls at these plants. His income is greatly enhanced by this work, and at the same time he is rendering a valuable service to over two thousand employees in his city. And for a nominal cost these employers are increasing the efficiency of their working force to a greater extent than they realize.

II. A **large department store** employing about 4000 people. This store has a woman physician who spends her mornings at their doctor's office. In the afternoon she does a similar work in a second but smaller store. She dresses the few accident cases which arise and spends the remainder of the time in rendering medical care to the girls who become sick while at work, in medical examinations of all applicants for work and similar examinations among the old employees, and in general health supervision. Besides store sanitation this involves a close study of working conditions, home conditions, habits, and environments of the girls, and all matters which would tend to undermine their health. She has a wonderful personality which enables her to gain the girls' confidence.

Three trained nurses assist in this work. One is at the doctor's

office at all times to render first aid in her absence, in the case of either accident or sickness. The other two visit the sick employees in their homes and render any aid they can to these—showing the friendly interest of the concern in their welfare. The information gathered by the nurses gives the doctor her insight into the home environments and habits of the girls.

This woman besides being a physician to the individual case, prescribing a pill here and bandaging a cut finger there, is also the medical advisor and confidential friend to 7000 girls, and has become an efficiency expert to her employers. A job certainly big enough for any individual!

Large rooms for recreation have been set aside for these employees. Adjoining them are dining rooms where food, prepared by the direction of the doctor, is served at a rate below that of outside restaurants. The lunch hour has been extended from ½ hour to ¾ hour, and this allows the girls to dance and play games during the noon period, thus returning to their work refreshed and energetic. Evening entertainments have been provided which are much more beneficial to the girls from both a moral and health standpoint than the average festivities of the city. Many and varied talks to the employees, in groups and individually, have corrected conditions in their diets, modes of dressing, improper sleeping rooms, loss of sleep, and unsanitary home surroundings. These, combined with corrective measures in the individual from a medical and surgical standpoint, have increased the efficiency of the forces in these stores and decreased time-loss on account of sickness almost fifty percent. It is no wonder that the proprietors have installed ventilating systems, inverted lighting systems, and many other costly yet helpful health measures, on the recommendations of this physician.

III. An **electrical concern** with 5000 employees. Here we have the example of the chief surgeon as a full-time man, with a full-time assistant. This concern has a well-equipped, four-room doctor's office and an additional staff of four nurses. The work was primarily surgical, but gradually this has extended until the assistant's time is devoted altogether to the medical examination of employees. Applicants for work are not examined until they have been employed for at least three months. This plan is adopted as it obviates the examining of many applicants who only remain a week or a month on the job. Naturally the two chief purposes of a medical examination of applicants are lost by such a procedure; namely, the protection of the old force from contagion, and the proper selection of a job for the partially handicapped.

One nurse is constantly in attendance at the doctor's office as an assistant to the physicians. The other three nurses spend their time

in visiting all absent employees. These visits are fifty percent helpful to the working force and fifty percent for the purpose of spying on the employees to ascertain why they are away from work. While the latter work may be necessary, yet it cannot be connected with the former and give the desired results from a medical standpoint. Visiting nurses' work among employees, to be beneficial and to have the co-operation of the entire force, must be based on altruistic, humanitarian grounds only—friendly interest, health supervision, and a desire to help whenever and wherever possible.

IV. A **large automobile concern** employing some 30,000 men and women. The system herein outlined is similar in many respects to that in vogue in several of our large industrial establishments.

Here we have the example of the large, full-time medical staff, which is very efficient, and is represented by some of the best medical and surgical talent of the country, because this concern, and many like it, are willing to pay for the best, especially for the chief of staff.

The central doctor's office consists of twelve rooms, large, airy, well lighted, with tile floors, white walls, and furnished in white enamel fixtures. It has a large waiting room, two private consultation rooms, two surgical dressing rooms, a room for eye, ear, nose and throat work, examining rooms, x-ray laboratory, and a general laboratory.

In addition to this central office there are six medical sub-offices, or first aid stations. These are in charge of well-trained, first aid laymen whose duties are to render immediate care to any injured employee, and, except in case of very slight injury, to see that the patient goes at once to the central office for care by the physician in charge. The reduction in infections and other complications more than pays for the extra expense of maintaining these first aid stations. Besides this first aid work, these men have been trained as experts in accident prevention. Whenever an accident occurs they investigate the cause and report the same in great detail with recommendations for its correction.

The duties of the medical staff are as follows:

1. To render proper and immediate surgical care to the injured coming directly to the office or sent there from the first aid stations. The major injuries requiring outside hospital care are sent there in an ambulance, and the surgeon on the staff goes to the hospital and does whatever operative work is indicated. Neither this surgeon nor any of the others on the staff are permitted to have private cases. Their time is given entirely to this concern.

2. To examine all applicants for work and to so co-operate with the employment department that all new employees are placed at work for which they are physically fit.

3. To examine and re-examine any employee whenever some

condition in the man himself, in his work, or in his environment indicates the necessity.

4. To periodically examine those with handicapped conditions who were allowed to go to work, or who have been discovered subsequent to employment and to place them at suitable occupations.

5. To supervise the medical or surgical treatment which the sick employees receive in their homes from their family physicians. When mal-treatment indicates the need, the medical staff of this industry does not hesitate to take charge of the case.

6. Special medical care is given to tuberculous employees in a sanatorium owned by the concern.

7. To co-operate with the welfare or sociological department on all matters pertaining to the health of the employees either in their working place or in their homes.

The medical staff necessary to carry on this work consists of seven doctors, four nurses and twelve lay assistants. Much of the visiting work done by nurses in other establishments is left to the visitors of the sociological department in this plant.

V. **The Industrial Medical Office Serving Several Industries.**— Several cities have examples of this system, but Doctors Selby, Heath and Heim of Toledo, Ohio, have developed it to the greatest extent.

It consists of establishing a well-equipped doctor's office in the vicinity of several industries. These concerns can thus secure excellent medical and surgical services for their employees at a much less cost than if they created a separate system. Three such offices are maintained in different sections of the city by these physicians.

In the mornings they spend their time at these offices and in the afternoon at the hospital, caring for the more serious cases it has been necessary to refer there. During their absence from these offices assistants are constantly in attendance to render emergency treatment and to call one of the doctors in the more serious cases.

Nurses are employed to assist the doctors in their surgical dressings and to do visiting nurses' work for those concerns employing this branch of the service.

The doctors have influenced the different plants to install safety engineers and are constantly co-operating with these to prevent accidents.

Likewise, sanitary inspections of the plants are made by these physicians. Since one of them is a member of the City Board of Health, unsanitary conditions in the community surrounding the plants are carefully investigated and corrected.

Recently they have extended their health supervision to include physical examinations of employees. As their work grows it will become necessary to double and triple their staffs.

Such an arrangement as this is ideal in many respects. Every industry in a city should co-operate to secure some such central plan which includes every branch of preventive medicine when they cannot develop their own medical department. By insisting upon the physical examination of every applicant for work and by periodical medical examinations of their old forces, a card index of the physical condition of every employee would soon be filed in the central office.

Vaccinations, typhoid inoculations and other preventive measures could be included in the work. Then by following up every case of sickness by a large, competent staff of visiting nurses communicable disease could soon be controlled.

Doctors employed for the sole purpose of visiting sick employees, without interfering with the treatment except where definitely indicated, but to ascertain that medical attention has been sought and is being given, would reduce the length of sickness and therefore time-loss to a marked degree.

Such a system would have wonderful influence over the public health of the community, would raise the standards of medical and surgical practices in the city, and by having a central office would obviate much duplication of work.

Who should be more interested in the health of the community than the industries employing the people of that community? Therefore such a co-operative plan is logical and results in benefits to both the employer and employee.

VI. Complete Medical and Surgical Care for the Employees and Their Families.—For many years large mines in the West, and a few railroads, have had arrangements with their medical staffs whereby for a stipulated sum, usually one dollar per month, the employee and his family can receive free medical and surgical treatment at any time. Some of these have developed large hospitals and render excellent medical care to their sick. Practically all these systems employ entirely too small a staff of physicians. The doctors are busy day and night caring for the sick and injured and can give very little time to developing preventive medicine and health supervision. In recent years, however, some of these concerns have turned their attention to this more humane work. Nowhere could a more ideal system of industrial medicine and surgery be evolved than in these mining communities and railroad systems with their extensive hospital arrangements.

One large street railway corporation has extended its health and safety work to include free medical and surgical care for its employees and their families. There is no cost whatever to the workman for this service. They have figures showing that the reduction in time

lost due to immediate and competent medical care more than offsets the expense of this work.

A great many concerns employing from 1000 to 10,000 people have established in their plants well-equipped doctor's offices. They have retained their old company surgeon whose sole idea of the work is the dressing of injured cases, or they have put an untrained man in charge on an inadequate salary. Such concerns wonder why their medical departments are so expensive and why they do not obtain the results so glowingly spoken of by other establishments.

One of these industries, a most progressive automobile factory, built a beautiful medical dispensary. They retained their old company surgeon just to do their surgical work and sought a younger man to take charge of the medical work and supervision of the health of their employees. I was asked to recommend a suitably trained physician and sent in names of four men trained in the Industrial Medical Clinic of Rush Medical College. These men all refused the job because the concern asked them to give their full time to the work for one hundred and fifty dollars per month. They finally secured the services of a man for such a salary. In six months they let him go. Another man was employed for a similar salary. His requests for assistants and nurses were not granted for reasons quite obvious considering the initial pay for the chief of staff. This concern is not at all enthusiastic over the results of industrial medicine and surgery.

No individual proprietor, president of a corporation, board of directors, or anyone else in authority should contemplate introducing a comprehensive system of medical and surgical work among their employees without being willing to stand an initial outlay of money far in excess of what can actually be shown in dollars and cents as a monetary gain to them for such work. They must first see the vision of what lies within their power to do for human conservation. They must first be imbued with a great desire to see the working home of their people a healthful, sanitary place, with protection of every kind for both life and limb. Then the happier, contented working force, the healthier, more efficient employees, the reduction in "time-loss" from sickness and accidents, the decrease in "hiring and firing," the ever increasing loyalty and experience of old hands, these and many other by-products from such a system will be theirs to place in the credit column.

"But how much money can we credit to these?" Who knows! Many a good man has tried to estimate the value of this work in dollars and cents but has always failed.

Rest assured, Mr. Employer, that the increased productivity will pay far in excess of outlay for such protection.

CHAPTER IV

THE NURSE IN INDUSTRY

Industrial nursing, like industrial medicine, has developed into a new specialty in the medical field. These nurses are absolutely essential in any comprehensive plan for the supervision of the health of employees.

The successful industrial nurse must have a strong and likable personality, a well-developed social sense, leavened with much common sense, and a creative instinct which will enable her to devise new methods of increasing the scope of her work. It is impossible to outline the exact duties which the nurse in industry must perform for new duties and new methods of approaching them are constantly arising. No nurse's training school can fit a nurse for this special work but she must learn it by actual experience in the field. At present it is planned to start an industrial course in Chicago which will enable these girls to obtain an interneship, as it were, in some of the large industrial dispensaries. Such a plan would greatly increase the effectiveness of the work of the human maintenance departments in industry.

Miss Mae Middleton, one of the most prominent industrial nurses in this country, has written the following article for this book. Her experience, extending over a period of several years, enables her to speak authoritatively on this subject.

"Although Industrial Nursing, as we know it, is a comparatively new branch of Public Health work, it is at least twenty years since industries began to realize the necessity of having medical and nursing service, especially where a large number of people was employed and where the work was hazardous.

"At first this work was confined to emergencies only and was entrusted to the care of a man who had received some instruction in First Aid, or to the so-called nurse, who frequently had little or no training; the graduate nurse was seldom employed.

"The benefits to be derived from well organized medical and nursing service, conducted by professional workers, had not yet been recognized or demonstrated in the business world, although it had been thought out and applied in relation to the community by many earnest civic students and workers. Facts revealed by comparatively recent and intensive studies in social and economic conditions, as well as the obligations imposed by employers' liability laws, have led employers

to recognize it as a very important asset in the prevention of disease and accident, and in the preservation of the health and efficiency of the employee; it is also of great value in creating a spirit of loyalty and contentment among the employees, where, for various reasons, it was often sadly lacking or non-existent—so that now the employers seek, for the management of their medical departments, the expert physician or surgeon and the graduate nurse with special social service training.

"The medical and nursing service of a large plant is responsible for maintaining the health of the employees to the highest point of efficiency possible, in order that the firm may receive for the services of this department adequate compensatory returns in the form of less time lost, fewer accidents, and better sanitary conditions—with the result that there is a better quality of work done by the employees, and an increased output.

"The hospital department, with its staff, in addition to the healing of disease and alleviation of pain, is ever on the look-out for sources, causes, and conditions from which they may arise, and must engage in study and effort, in co-operation with other departments and organizations for their cure and removal, as, for instance, in the case of Mr. S.

"Mr. S., employed as porter, was usually a very industrious and good employee, but, owing to the frequent illness of his children, he became absent-minded, worried and very much run-down. The first call by the nurse was made at his home July 28, 1917. The nurse found five children, ages eleven, eight, five, and two years, and a baby four months old. All the children appeared undernourished. The family lived in a four room basement flat, poorly ventilated but fairly clean. The mother seemed to have no conception as to the proper food for the children, the two-year-old eating as many as 10 bananas in one day. Little Joe, the four-months baby, was very ill, and though the thermometer registered nearly 90 degrees, the poor little fellow was tightly bound up in a feather pillow. There were no screens on the windows, and the place was just swarming with flies. The baby was given a cool bath immediately (he had a temperature of 103) and made comfortable.

"On July 30th the nurse called again and brought the baby in to one of the house physicians, who makes a specialty of infant feeding. The doctor examined the baby thoroughly and said that, although the baby was very ill, he would pull through with proper care. The mother and baby were sent home in a cab, owing to the extreme heat, and the nurse followed soon after, with nursing bottles, nipples, a small kettle, and everything needed for preparing infants' food. She taught the mother every detail in regard to the sterilization of bottles,

the care of milk, etc., but they had no ice. This great need was explained to the welfare department, and the nurse was given a check to purchase an ice-box. In less than one hour the ice-box was installed. The mother was also taught the proper method of bathing the baby, and the two-year-old child was put on a diet.

"On her next call, August 1st, the nurse found the baby much improved; the mother carrying out instructions to the letter. The landlord had put screens in the windows, and there were no flies this day. Also, the department manager reported that Mr. S. was doing much better, taking more interest in his work, and looking better.

"When again examined by the doctor, August 6th, the baby was found to have gained ¾ pound, and its diet was increased.

"By this time all the children seemed better. The nurse called every other day for a while, and the baby continued to improve. Later, owing to the busy season, the nurse was unable to call so often, but she left word with the family to report any change. Then some neighbor suggested that they give the baby tea, and he became very ill. The nurse again called every day and gave the baby care, but he did not improve and later died.

"However, the work was well worth while, for the change in the rest of the family was wonderful. In place of coffee and buns every morning and noon, they now have cereals, vegetables, etc., and in consequence Mr. S., as well as the children, is better nourished and happier.

"The daily routine of the nurses department involves:

"Assisting the doctors in the examination of employees returning to work after absence on account of illness.

"Assisting in the dressings of surgical cases.

"Administering to the employees sent to the rest rooms.

"Calling of all employees who, at the doctors' request, have been scheduled for re-examination.

"Assisting in the examination of new employees and those desiring to join the benefit association.

"Assisting in the examination of those sent from their departments for examination because of frequent absence or inability to keep up with their work.

"Assisting in the care of relatives of employees, who, on account of financial conditions, are unable to obtain medical or hospital care.

"Visiting sick employees in their homes.

"The nurses answer calls made by the departments on all emergency and accident cases which are of such serious nature that they are unable to come to the doctor's office alone and must be brought by means

of wheel chairs or stretchers. Many of these cases are temporary conditions, such as dysmenorrhea, faints, headaches, etc., and after rest and care are frequently able to return to their work.

"The routine examinations, however, often disclose cases of acute infection, such as typhoid, pneumonia, or those requiring surgical care. Provision is made for the care of these employees in hospitals, sanatoria, homes or other institutions, through co-operation with the welfare department, the family, and the family physician. In urgent cases, requiring immediate hospital care, the family and their physician (if they have one) are reached by telephone. This is followed by a call from the nurse, in order to assure the patient, who is usually concerned about conditions at home, and to allay the fears of relatives, as in the case of Mr R., who was sent to the doctor's office because he complained of pain in the right arm. He was examined and sent to the hospital with a diagnosis of cellulitis.

"The nurse called at his home, to tell his wife, and found he had two children, one 2½ years and one nine months old. The oldest child had a temperature of 103.4, axillary, and was in a comatose condition; the other child had a temperature of 102.6, a sore throat and rash. The mother herself had a temperature of 99.8 and was tired out, as she had had no sleep for three nights. The nurse immediately gave both children sponge baths, to reduce their temperatures, prepared milk for them and instructed the mother how to give them the necessary care. She then returned to the plant and reported the case to one of the company physicians, who was also an infant welfare specialist, and he went with her to the home to see the children. After prescribing treatment, he advised putting on a special nurse for one week. Through co-operation with the welfare department this was done, the firm paying for the nurse. At the end of the week both children were so much improved that the nurse left. However, a week later the older child became very ill again with a discharging ear and an enlarged cervical gland, so the nurse brought him in to the doctor's office, where the gland was opened. As this required subsequent dressings, the nurse called daily, making 25 calls in all on the child, besides frequent visits to the hospital to let the child's father know of his condition.

"The man is now back at work, his wife and children are in good health and all are very grateful to the firm for the interest shown and aid given.

"The following illustrates the daily routine of the nurses at the plant and in the homes.

"Usually morning duty is in the hospital. Possibly the first patient complains of headache. The temperature is taken and found normal, as is also the pulse; nothing abnormal about the throat. The patient

is taken to the doctor who prescribes aspirin or Seidlitz powder, and is then allowed to go to the rest rooms and lie down until better and feeling able to return to his department.

"Perhaps the next patient coming in complains of stomach trouble, wishes to see the doctor and to have a thorough examination. He is very fearful of an ulcer of the stomach. He was not able to retain any of his dinner the night before; had just a 'common dinner,' consisting of pork, cabbage, potatoes, jelly cake and tea. This patient is referred at once to the doctor.

"Last, but not least, comes a new employee, who must have height, weight, pulse, temperature, eye-test, personal and family history taken. He is asked to please take off his wraps and hang them on the back of the chair. From the effort he makes to find a chair in the next room, ignoring the one pointed out to him, and from his answer, 'Leedle bidt, missus—not so much,' to the very common question, 'Do you speak English, mister?,' the nurse is prepared for almost any sort of answers to her questions.

" 'When were you vaccinated?'

" 'Vacci-? Vacci-? Me no understand, missus.'

" 'When did the doctor scratch your arm and put medicine in it?' The part of the arm is indicated.

" 'No, sir. Me no got scratched.'

" 'How many years have you been in America, Mister?'

" 'Four years—maybe five, all right.'

" 'When you came over on the boat, didn't the doctor on the boat scratch your arm and put medicine in it?'

"A look of understanding dawns. He smiles and says, "Yes, sir. Me got it.'

"Then, 'Do you read English, mister?'

" 'Leedle bidt, all right.'

" 'See that card hanging out there, with the letters on it?'

" 'Yes, sir.'

" 'See the red line?'

" 'Yes, sir.'

" 'Will you please read the letters on it?'

"This is done, and, to be sure the letters have not been memorized while he has been awaiting his turn, the nurse says, 'All right. Now read them backward, with your left eye.' She places a shield over the right eye and wonders why the man gets up and slowly turns around, putting his knee on the chair and craning his neck over his shoulder; then it dawns upon her that he is really trying his best to read them 'backward.'

"So it goes through the morning—with variations.

"In the afternoon the nurse takes a list of the absent employees in her district and tries to visit as many as she can.

"Call No. 1.—Possibly this takes her to a neighborhood with which she is not familiar. She asks a youngster, 'Is this N. Place?' and receives the following answer: 'Naw, this ain't it. This is N. Avenue. Go down this way and jerk over, and that's it.'

"She finds the street and number and learns that her patient lives on the third floor. When she inquires for her, she is told, 'No, she isn't in just now. She hasn't been feeling well, but is better to-day, so went for a walk.' The nurse is very glad to know that the patient is feeling better and 'Will she please report at the Doctor's Office in the morning?'

"Call No. 2.—On this call she finds her patient quite ill with a cold and sore throat. He is subject to two or three similar attacks during a winter. The tongue is badly coated; tonsils are very much enlarged, with very small, white patches. She inquires if the patient is under the care of a doctor. 'No. He has been taking hot drinks and used a gargle prescribed for the last attack, but hasn't any more left.' The patient is advised to take a cathartic, preferably castor oil; to gargle the throat with a hot solution of baking soda every two or three hours—a teaspoonful to a glass of water; to drink as much water as possible; to get plenty of fresh air; to keep his dishes separate from those used by the other members of the family; and to be very careful of excretion from the throat and nose. If not better by noon, he is told to call his family doctor, and last, but not least, to see his own doctor or the doctor at the plant as to advice about tonsillectomy. In two days the employee reports, wishing to return to work, and is referred to the doctor.

"Call No. 3.—This patient is found to be very ill. He has had a stroke of paralysis, involving the entire right side, several days ago. He is in a semicomatose condition, and has just been made comfortable by a practical nurse, who is a relative. Evidently there is nothing that can be done for the patient at this time. The nurse tells the wife that if there is anything she can do, she will be very glad to do it. The wife replies, 'No, there isn't anything to-day.'

"'Very well, I'll call again tomorrow.'

"On revisit, the following day, the patient's condition is apparently the same. The pulse seems of a fairly good quality, slightly irregular; respirations seem to be Cheyne-Stokes type. The patient has been lying on a davenport, and his wife is very anxious to have him moved to the bed, but the nurse (at the home) is not feeling well and, 'Will you please help?' The wife is asked if she has the doctor's permission to move the patient and she says, 'Yes, he thought it a very good idea.' The nurse suggests the placing of the bed, so the best light and venti-

lation are obtained. The bed is made up with an oilcloth protector and draw sheet, and instructions are given as to how to remove the sheet with least discomfort to the patient. Blankets are placed in readiness to place the patient between for a bath. Fellow employees soon come to help move the patient to the bed. His condition does not seem any worse because of having been moved, and he is allowed to rest for a short time before given the bath. A sponge bath and alcohol rub are given, and the patient is made as comfortable as possible. The bedding is adjusted so that the weight will not be too much on the extremities, and the wife is told that if help is needed again, the nurse will be very glad to come.

"In the meantime, some observing forelady at the plant has noticed the condition of the head of one of her employees and has sent her to the hospital. The girl's head is inspected by one of the nurses and found to be in need of treatment at once. It is necessary to cut some of the hair and apply ointment to the scalp where the skin has been scratched, and the first of a series of treatments is given. The girl is sent home and told to leave her head just as it is; that a nurse will call in the morning to give another treatment.

"In the morning the nurse, armed with gown, gloves, tooth picks and ointment, makes the promised call. She finds that there is no kerosene in the house and has to wait until someone goes out to buy some. There is quite an improvement in the condition of the head. After all her articles are laid in readiness, the nurse proceeds to relieve the head of as much vermin as she can, then applies more ointment to abrased area, saturates the hair with equal parts of olive oil and kerosene, and ties up the head, with instructions to leave it that way for four or five hours, then to fine comb the hair and wash with warm water and soap, and, when nearly dry, to apply hot vinegar and use the fine comb again. This treatment is to be continued for two more days; then the girl is to report at the hospital. Before leaving the home, the nurse makes sure that the rest of the family is going to be taken care of in the same way, if necessary.

"In all of the examinations made at the hospital, the nurse can be of great assistance to the company physician by conserving his time and preventing duplication of work. As it is impossible for the physician to see all cases coming to the doctor's office, it is the duty of the nurse to select only such cases as it is absolutely necessary for him to see. The nurse should make sure:

"*First.*—That the physician has all the data concerning patient's home, financial and working conditions.

"*Second.*—That he has a complete record of all previous medical, surgical or dental examinations; also any family medical history that might aid him in making his diagnosis and in recommending such

disposition of the case as would be to best advantage of both the employee and his employers.

"In well-organized medical departments of large concerns, one nurse is usually assigned to follow up tuberculous cases only. It is not just the case of the tuberculous employee; the whole family must be examined for possible infected contacts; home conditions must be looked into and changed, if necessary, and the family instructed as to home and personal hygiene. The home of Mr. O. is a case in point.

"Mr. O., who had been placed in a sanatorium, wrote as follows:

> 'I desire to inform you that on Tuesday, September 25th, I left the F. A. Hospital and came home, after spending 15 months in the institution. For the past three months I have been confined to bed because of high fever, so I decided that as my progress was none, it was as advantageous to come home as remain in the institution, since there, I must confess, improvement is rather slight.
>
> 'In conclusion, I will say that I am very grateful to S., R. and Co. for the effort put forth in bringing about my recovery, also I am highly pleased with the medical department for the kindness shown on all occasions.'

"A few days after his return home, the company physician and nurse were called and found the patient had developed a discharging right pyothorax, necessitating his return to bed. The nurse made daily calls to dress the wound and give bedside care.

"The efforts of the nurse to instruct Mrs. O. will best illustrate the difficulties encountered in attempting this hygienic education.

"Mrs. O. seemed to think that the care given by the nurse was sufficient, and it seemed almost impossible to make her realize that Mr. O. should be bathed frequently, and that the bed should be kept neat and clean. After explaining in detail just what to do, to make Mr. O. comfortable, the nurse would be answered in the following manner:

"'Sure, whin he do be in good hilth, he always washed his face and hands ivery mornin' before goin' to woork. He always looked so nice the neighbors often wundered how he could git out of this dirty hole lookin' so foine. Nurse, I don't think it would be nicessary to wash him ivery day now. He never shwits. Sure, he could wear a pair of socks for a long toime and they do be niver shtiff with the dirt.'

"As it seemed impossible to persuade Mrs. O. to give the patient proper care, he was induced to return to the sanatorium, where he now is.

"**Qualifications of the Industrial Nurse.**—The nurse intending to take up industrial work should have as her foundation training in a good general hospital, and, in addition to this, some experience in other forms of public health nursing, as this is almost as essential. She should be in good physical condition; have patience, tact and sympathy, acting as the employer's representative, both at the plant and in the home, in bringing aid and comfort to his injured or sick

employee; she must have insight and wisdom, in order to interpret correctly the employer to the employee, and vice versa.

"In the last five or six years much has been done in the field of industrial nursing, and many nurses have taken up this work. About 1½ years ago the Chicago Industrial Nurses Club was organized, and it now has an enrolled membership of between 65 and 70 nurses, all of whom are employed in industries in Chicago. While this shows clearly the possibilities of the future development of this branch of public health work, as yet it has simply cleared the way to larger horizons, and it is to the industrial nurse of to-day that we must look to create the standard for industrial nursing. To her is given the opportunity to make the work so valuable, not only to the employee, but to the employer, that she will be considered an integral part of any plans made by him for the health and welfare of his employees."

CHAPTER V

EMPLOYEES DENTAL SERVICE

The medical and surgical dispensary in industry is not considered complete unless it provides some form of dental service for the employees. For several years a number of our best industrial clinics have included dentists on their staffs. In this respect they have taken a more advanced scientific position than the majority of our medica' dispensaries connected with medical colleges.

During the last ten years Billings, Rosenow, Davis, Dick and many other investigators have absolutely proven that foci of infection hidden in different parts of the body are the actual cause of many onstitutional diseases. The commonest sites for hidden infection are about the teeth. As a result, the medical profession now includes a careful examination of the teeth as a definite part of the systematic physical examination of the patient. Closer co-operation with the dentist has been established and just as the internist refers his gall-bladder and diseased appendix cases to the surgeon for operation, so he refers his patients with infected mouths to the dentist for treatment. The *x*-ray has become the most valued ally of both the doctor and the dentist in discovering these foci of infection about the teeth.

Physicians and surgeons connected with industries were among the first to recognize the great economic value of properly supervising and caring for the employee's teeth. These men who had advanced industrial sanitation to such an extent now realized that the same laws of sanitation must be applied to the individuals. The work of the dentist in industry is quite analogous to that of the sanitary inspector. His inspections, however, are limited to the employees' mouths and his corrective measures are directed to cleaning up the dirty teeth. No medical school of to-day which prides itself upon its efforts to teach preventive medicine can longer afford to neglect the establishment of a dental department in its dispensary.

During the year prior to the establishment of a dental clinic in the concern with which the author was connected, 1100 employees reported to the doctor's office on account of toothache, abscessed teeth, or some other condition traceable directly to the teeth. It was necessary to send many of these employees to an outside dentist for emergency treatment. Because of the lack of adequate supervision of

these cases, many of them were satisfied with the immediate relief and failed to continue the treatment until permanent relief was obtained. Naturally recurrences were common and such employees lost considerable time from work. Even if no actual time away from the plant was lost, yet a workman with a toothache has a very questionable efficiency. It was impossible to obtain actual figures as to the financial loss this concern was sustaining due to diseased teeth among the workers, but sufficient data were collected to convince the management that a dental clinic would be a great economy.

The prevalence of unclean mouths among the employees due to decayed teeth, pyorrhea, hidden abscesses and other like conditions is shown by the reports of the examinations of applicants for work by different surgeons. Dr. Irving Clark found that 92 per cent. of all applicants showed some diseased condition and this high disability rate was due chiefly to faulty mouth conditions. The reports from my clinic showed that approximately 90 per cent. of the applicants had some dental defects. The Life Extension Institute reports 98 per cent. of the people examined by their doctors showed physical defects and practically all of these were due to diseased conditions of the mouth alone or combined with other conditions.

I recently had the opportunity of examining 16,000 draftees who were placed in "limited service class" because of some physical disability and were ordered to report to Syracuse Recruit Camp. Over 4000 of these young men had been placed in limited service because of diseased teeth or because of an insufficient number of teeth. Approximately 500 of them had plates and over 200 had lost all of their upper and lower teeth. Approximately 70 per cent. of the contingent sent from the New England States had fine physiques, and their only defects were due to the teeth, many of these having lost all of their upper or lower teeth or both. Such figures clearly prove that as a nation we are neglecting the care of the children's teeth and when they reach the age to voluntarily seek dental care, it is too late and the dentist is forced to his last resort, namely, extraction.

The above figures conclusively demonstrate the prevalence of diseased teeth. The spirit of prevention should certainly force every physician in industry to attack this problem with renewed energy and his greatest ally should be a qualified dentist working with him in the plant.

In 1914 I found approximately 20 industrial concerns were giving some form of dental service to their employees. Dr. Lee K. Frankel, in 1916, sent a questionnaire to several industries for the purpose of ascertaining the number giving dental service to employees and the kind of treatment given. He received replies from 27 establishments all of whom either employed dentists or had some arrangement with

outside dentists. Dr. Selby in his recent investigations, conducted by personal visits to a great number of industries, found that quite a number were paying considerable attention to the care of the employees' teeth.

The various systems in vogue in different industries can be classified as follows:

1. Dentists employed on part or full time; a fully equipped dental office in connection with the plant; dental service given to the employees at the company's expense and on the company's time.

The dental service given consists of: (*a*) Examination, cleaning, filling, bridge, crown and plate work and extraction; (*b*) examination

Fig. 12.—Tooth-brush drill conducted by the company nurse. (*Colorado Fuel & Iron Co.*)

and cleaning only, with the necessary dental work performed by outside dentists under supervision of the plant dentist; (*c*) examination only, with supervision of the necessary dental work performed by the outside dentist.

2. Dentists employed by industries; a fully equipped dental office in connection with the plant; dental service given at employee's expense but on the company's time.

Frankel found at least six concerns operating under this system. The dental service given extends all the way from examination with complete dental operations to examinations and cleaning only. The service and the material used, such as gold and porcelain crowns, material for filling, etc., are furnished at cost.

3. Arrangements made with outside dentists, or dental dispensaries, to furnish dental service at a reduced rate to the employees.

Practically all of the concerns using this system have their own

medical staffs. The doctors examine the teeth at the time of physical examination of employees and refer those needing dental service to the outside dentist or the dispensary.

4. At least three industries furnish free dental service to the children of employees. The visiting nurses of these concerns have been thoroughly trained in examining the teeth of the children and are instructed to refer all needing dental care to the dental clinic at the plant. These nurses likewise give lectures to the mothers and children on dental hygiene and instruct them concerning the proper use of the toothbrush (Fig. 12).

Practically all of the industries operating under the above systems give lectures and individual instruction to the employees concerning dental hygiene. Some of them furnish toothbrushes and mouth washes at cost to their people.

The equipment of the dental offices in most places is very complete. A few concerns have even installed x-ray machines for radiographic examinations. Those giving complete dental service must naturally have more chairs and more elaborate equipment than those simply making examinations, and then supervising the treatment given by outside dentists.

Dr. Frankel's description of the dental clinic at the home office of the Metropolitan Life Insurance Company, gives an excellent illustration of this form of employee's service.

"The clinic was opened July 1, 1915. The equipment was the best obtainable. It included:

"Four S. S. White Evans-Forsythe Dental Units, which consists of chair, bracket, engine, cuspidor, and compressed air attachment.

"Four S. S White Lyons operating stools.

"Four electric spray heaters.

"One Ritter Columbia dental chair.

"One Ritter dental engine.

"One electro-dental switchboard.

"One Waugh radiographic machine and lead screen.

"Two sterilizing outfits.

"Four small cabinets.

"One large dental cabinet.

"One metal and glass linen cabinet.

"Complete set of instruments, towels, bibs, etc.

"It was planned that the work should be limited to a careful examination and cleansing of the employees' teeth each six months. The results of the examination are charted and copies of the charts are given to the employees, indicating what subsequent treatment will be necessary by their own dentists.

"A follow-up system was inaugurated to ascertain whether the neces-

sary attention is given. No attempt was made to require or compel employees to come to the clinic. From time to time addresses were delivered by the dentists in charge to the employees, indicating the value of proper care of the teeth.

"There are approximately 5000 employees in the company's service at the home office; 2870 treatments were given to 2707 patients in the first six months, July 1, 1915, to Dec. 20, 1915. In the second six months 3383 treatments were given to 2843 patients. In the first six months the average time required for examination and cleansing was approximately sixty-six minutes. With the experience gained by the dentists in charge this was reduced so that in the second six months the average time was forty-nine minutes. The average time required is constantly decreasing. Viewed month by month this is shown very clearly. In January, 1916, the average time was sixty-three minutes, in February fifty-four minutes, in March fifty-three minutes, in April forty-eight minutes, in May forty-seven minutes, and in June thirty-five minutes.

"The clinic is in charge of Dr. Thaddeus P. Hyatt, who has under him four assistants and a radiographer. Seven women are employed in the dental clinic as assistants to the dentists, as telephone operator, in the sterilizing room, etc. All the dentists are full-time employees with the exception of Dr. Hyatt. The service given to the employees is free and on the company's time.

"I am giving you, herewith, the statistics for the second six months, namely: Jan 1, 1916, to June 30, 1916, as these are probably more indicative than would be those in the first six months of the service. In this time prophylactic treatment was given to 2315 patients and emergency care to 528 additional patients, making a total of 2843 patients cared for in the period. The average time for emergency cases twenty-one and one-half minutes. Under this term is included: treatment for abscess, pyorrhea, exposed pulp, gingivitis, pulpitis, pericementitis, infected tooth socket, toothache, and extractions and consultations.

"The cost of the entire service was $7229, or an average of $3.00 per hour, and an average per patient of $2.33. Subdividing the prophylactic work from the emergency work the cost per patient for the former is $2.46 and for the emergency work the cost per patient was $1.06. Assuming that employees accept service of this kind each six months, the cost per treatment per patient per annum would, of course, be double the figure given per employee treated.

"The results even thus far obtained are of considerable interest: Of the clerks who appeared in the first six months, 1637 who showed cavities on the first examination reappeared during the second six months. These clerks on the original examination had 7753 cavities or an aver-

age of 4.6 cavities per person. During the interval between the first and second examination 916 clerks (56 per cent.) out of the 1637 who had cavities had 2936 fillings made, or an average of 3.2 fillings per clerk.

"There are other evidences of improvement although they are not of such importance. At the time of the first examination 3.9 per cent. of the clerks did not use a toothbrush. At the second examination it was found that this had been reduced to 2.9 per cent. At the time of the first examination 32.9 per cent. of the clerks did not show clean mouths. At the second examination only 22.5 per cent. showed such condition."

In June, 1914 a dental department for employees was established in connection with the doctor's office in a concern employing at that

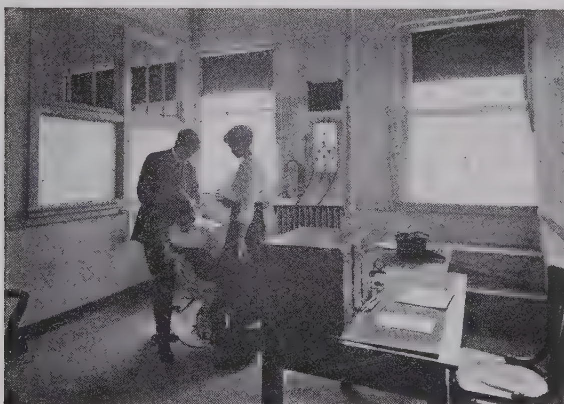

FIG. 13.—The Dental Office, an essential adjunct to the Industrial Dispensary. (*Courtesy Sears, Roebuck & Co.*)

time approximately 12,000 people. The full-time service of a dentist was secured at first but this was later changed to the part-time service plan—one dentist spending four hours in the morning at the plant and another dentist four hours in the afternoon. Each dentist was paid a salary of $150 a month for this part-time service. The mistake which many concerns have made is in endeavoring to secure cheap dental service for their employees. A really good dentist cannot afford to give all of his time to an industry for less than $300 a month. The work of the dentists consisted in examining the teeth of all applicants for work referred to them by the doctors, whose duty it was to thoroughly examine the mouth, and to examine the teeth of all old employees, department after department, as rapidly as possible. Employees needing dental care were furnished with a card showing the dental work needed and were referred to their family dentist or to a dentist in the neighborhood in which they resided. The plant dentist

would then supervise this dental work and by every possible means short of compulsion would persuade the employees to continue treatment until permanent relief was afforded. Most of this dental work was performed at night but when it was necessary for the employee to report to his dentist in the daytime, this was done on the company's time. Those stating that they could not afford to pay for proper dental care were given a loan of money by the company, said loan being repaid at the rate of 25¢ to 50¢ a week.

This dental service has become very popular with the employees and the results obtained, especially the decreased loss of time from work due to diseased teeth, has more than paid for the cost of the dental department.

In the six months of 1914, 391 employees were cared for by the dental department; in 1915, 6081 employees; and in 1916, 8502 employees received this service. These figures clearly demonstrate the need for a dental department; that such service is looked upon with increasing favor by the working force is evident.

This is only another method whereby the employer can express a friendly interest in his employees. The returns from such service are shown by decreased time loss from work, a more efficient working force, and better health and generally increased morale on the part of the employees.

CHAPTER VI

A PRACTICAL SYSTEM OF INDUSTRIAL MEDICINE AND SURGERY

A DETAILED OUTLINE OF THIS WORK IN ONE LARGE INDUSTRY

In the metropolis of the middle west industrial medicine and surgery, as it is known in its broadest aspects, has become a recognized specialty. Here, in Chicago, at least forty of the larger concerns have developed some system of this work far superior to the old-time plan of a company surgeon simply to bandage the injured.

Co-operation between the employers, employees and the various medical staffs has resulted in the rapid growth of this new specialty, and to-day the doctrine of human conservation is fairly established in this city. The practical application of this doctrine is yet far from completion.

Here you see the Manufacturers Association holding joint meetings with the Industrial Surgeons Association, the Labor Organizations doing likewise, and all of these being represented on the Committee on Factories of the Chicago Tuberculosis Institute, the purpose of which is to extend this work into all industries. Six of the largest concerns have built shacks at Naperville for the free care of their tuberculous employees. Thirty-eight concerns have jointly bought a thousand acres of land in New Mexico and established the Valmora Sanatorium for the care of their more advanced tuberculous employees.

But other cities and states are rapidly overtaking Chicago in this great work. Pennsylvania Ohio, Massachusetts, Wisconsin, California, and a few other states, through their departments of Labor and Industry, have given a wonderful impetus to this work, and no longer can any one locality claim to be a leader without having the point well and vigorously disputed.

One of these industries in Chicago, employing over 15,000 men and women, has developed a system of industrial medicine and surgery which embodies most of the good points of the various plans. Therefore a rather detailed outline of the medical work in this industry is herewith submitted.

The doctor's office has nineteen rooms finished in the most up-to-date manner, and located on the top floor of the main building away from all noise and dirt. Every room, except three, has outside window light. These rooms are for the following purposes: one large

general waiting room; one large office and record room; one private office for the chief of staff; one private office for the super ntendent of nurses two history rooms; four examination rooms (one equipped for nose and throat examinations); a laboratory; a drug room; two well equipped surgical dressing rooms; a sterilizing room; two rest rooms; and two toilet and bath rooms.

The medical staff consists of nine physicians, two dentists, and twelve nurses during the busy seasons, and drops down to seven doc-

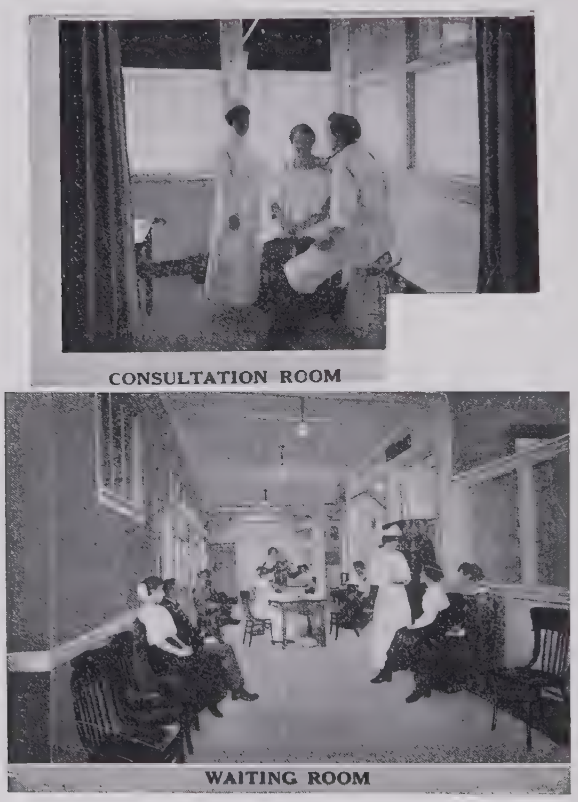

Fig. 14.—A view from the Doctor's Office. (*Sears, Roebuck & Co.*)

tors during the summer. An oculist is on the staff but does not spend any time at the plant. Each doctor spends three and one-half hours at the plant, so rotating that during the busy morning hours there are at least four physicians in attendance, the remainder filling in the rest of the day.

Recently a full-time woman physician has been added to the staff. Her work among the girl employees has more than demonstrated the great advantage of having a diplomatic, well-balanced woman physician to handle many of the problems presented by the girls.

Practically every one of these doctors is a specialist in some line of medicine or surgery, and his work at the plant is largely along this special line. Thus two good surgeons are represented; an orthopedic specialist is of the greatest value in many of these cases; a specialist on skin and venereal diseases is in constant demand for diagnosis, especially in differentiating between certain skin lesions and the acute contagious eruptions; a specialist on nervous and mental diseases, who is also a good diagnostician, conducts many of the examinations of applicants for work. Such a specialist is of the greatest value in fitting handicapped individuals to the proper job. A tuberculosis expert, an internist and a gynecologist are also included on the staff. These men are well-trained, broad-gauged industrial physicians during their three and one-half hours at the plant, capable of doing any work that usually falls to the plant physician. The remainder of the day they have free to themselves to develop their special line of work, and incidentally they are becoming more valuable to the concern because of this development.

The salaries paid these men are good, but the concern could not employ them for full time without an outlay that would make it prohibitive. But two good men, experts in their line of work and of considerable reputation in their community, can be employed for part time and their combined salaries do not exceed what the concern would pay for one mediocre physician giving his full time to the work.

The chief surgeon of this industry likewise devotes three and a half hours of his time at the plant. In the afternoon he operates on the major cases sent to the hospital and visits all such cases already in the hospital. When necessary he visits the employees in their homes. The administration of this work takes most of his time while at the plant.

None of the medical staff is allowed to accept as private patients any of the employees of this concern. This is necessary to remove the idea of any selfish motive on the part of the doctor when he strongly urges them to undergo some remedial work. An exception to this rule is when some one of the managerial force desires such service from one of the staff during the period he is away from the plant.

The duties of this medical staff can be outlined as follows:

1. Emergency treatment for all injured employees.

2. Subsequent daily dressings of injured.

3. The care of major surgical cases in the outside hospital.

4. Free surgical care for those who cannot afford to pay for proper care, or for minor conditions which would be neglected if the employee was referred to his family physician.

5. Free surgical care for all cases where the responsibility for their cause is doubtful.

6. Free surgical care for members of the employee' family where the nurse's report, or findings of the welfare department, show a dire need for aid.

7. The medical examination of every applicant for work and co-operation with the employment department to place the handicapped in suitable occupations.

8. The examination of old employees:

(*a*) Those returning to work after an absence on account of illness.

(*b*) Those seeking a pass home on account of illness.

(*c*) Those slated for re-examinations because of some pre-existing condition.

(*d*) Those seeking medical advice because they have learned to use the doctor's office, or on the suggestion of their floor manager (usually because they "look bad," are "slowing-up" in their work, poor attendance, etc.).

(*e*) Those referred from the surgical department for examinations.

(*f*) Those examined for membership in the benefit association.

(*g*) Those working in hazardous occupations. Monthly re-examinations are made of all exposed to occupational diseases.

9. Supervision of those needing medical treatment until they are placed under the care of the family physician or in outside hospitals.

10. Medical treatment where investigation shows they are not receiving proper care.

11. Medical treatment furnished free for all tuberculous employees, syphilitic and gonorrheal cases, and for those needing expensive, special medical care but who cannot afford to pay for it.

12. Emergency medical care for the acutely sick or for those with some temporary condition which medical treatment will relieve at once and allow them to return to work.

Every case must be handled as an individual and no hard and fast rules can be laid down which will cover every condition arising during the day's work.

13. Periodical sanitary inspections of the plant.

14. Supervision of the ventilation, lighting, control of dust, care of cuspidors and toilets, and all other conditions tending to promote health.

15. Co-operation with the safety engineer in the prevention of accidents.

16. Health and accident prevention talks and letters.

17. Fumigation of departments where contagious cases have developed, and constant watchfulness for new contagious cases.

18. Co-operation with the visiting nurses to relieve conditions found in the homes.

19. Co-operation with the city health authorities, the Tuberculosis

Institute, and with all family physicians for the protection of the patient and the community.

20. Co-operation with the welfare department to see that conditions revealed by the medical work are corrected in each individual case, as, faulty home conditions, lack of proper food and clothing, insufficient wage, lack of recreation, misfits in jobs, trouble between a boss and an employee, and numerous other conditions tending to undermine the health of the workers.

The two dentists each spend four hours at the plant. Their duties are:

1. The examination of all applicants found with bad teeth and referred to them by the medical staff.

2. The examination of the teeth of all old employees.

3. Recommending necessary work to be done, and charting this on a card which the employee is told to take to his family dentist.

4. Co-operation with the family dentist to see that work is completed and reasonable charge for the same is made and paid for.

5. Co-operation with the welfare department to arrange loans when necessary so that the family dentist can be properly paid at once. The employee repays the firm in weekly installments of fifty cents each.

6. Periodical re-examinations to see that work recommended for teeth has been done or is in progress, as well as to see that all prophylactic care is being carried out as directed.

7. Consultation work with the medical staff in running down hidden foci of in ections.

The oculist on the staff receives cases sent to him from the plant. The ordinary Snellen test is made at the plant dispensary and those falling below a certain standard are referred to the oculist. The latter examines these cases and corrects all with faulty vision. A loan arrangement is made with the employee whereby he can pay the oculist a reasonable charge and then repay the firm as described under dental cases. The details of this work are described in Chapter XXV.

The nurses devote all their time to the work. Their duties are indicated in the following outline:

1. All twelve nurses spend their mornings at the plant. In the afternoon eight of them visit sick employees residing in their prescribed districts.

2. Two assist the surgeons in the surgical dressings. They also prepare and sterilize all dressings.

3. Four are engaged in history taking and the eye tests. This is done on every case before being referred to the doctors.

4. Two are present in the girls' examining rooms at all times.

5. One nurse is in charge of the drug room, issuing medicine only on the order of the doctors.

6. One is in charge of the rest rooms. It is her duty to see that every employee going to the rest rooms receives every attention possible, does not take advantage of this as a means of loafing, and that any case needing medical care is brought to the attention of the doctor.

7. The superintendent of nurses and her assistant are busy in the administration of this machinery. It is their duty to see that every employee is waited on immediately without undue loss of time from his work.

The visiting nurses' work in the afternoon:

1. It is the duty of each nurse to visit as many of the sick employees in her distr ct as possible during the afternoon. In order to do this all calls are restricted to those employees who have been absent at least three days, and only periodical calls are made on those absent with long illnesses.

2. The nurse ascertains the condition of the patient, the nature of illness, if adequate medical or surgical care is being given, the name of the family physician, the home conditions, and if any special care is needed to insure the patient's recovery. Whenever necessary the nurse renders nursing care, such as a sponge bath, changing of the bed, instructing the mother or wife in food preparation, etc.

3. The nurse reports on these facts at once by telephone if urgent or the next morning on her return to the plant.

4. By co-operation with the welfare department special nursing care is given to a sick employee when these reports show the need. Or, based on the findings of the nurse, the patient may be removed to a hospital and further treatment rendered by the medical staff of the plant. Food, ice, bed-clothing, and many other necessities of the sick-room are supplied when ready money for these is lacking.

5. Reports on faulty housing conditions are investigated, and by diplomacy, education, and the judicious use of money, often in the form of increased wages, the family is moved into healthier, more sanitary surroundings.

An expert laboratory girl is in charge of a well-equipped laboratory (Fig. 15). Her duties can thus be classified:

1. **Urinalyses.**—Every applicant for work and every old employee given a thorough medical examination likewise has a specimen of urine examined. Re-examinations, two or more times, of the urine are made whenever a pathological condition is found in order to be positive of that condition before a report of the same is made to the employee.

Five years ago the specimen from one of the managers was examined and found to contain sugar in large quantity. He was told

that he had diabetes. The next day he went to his family physician who failed to find anything wrong. After seeing three good internists, all of whom reported the urine negative, he presented himself before the chief surgeon. The examination at this time was also negative. This man's indignation over the scare and expense he had been subjected to was a source of great embarrassment to the doctor's office. It takes months to live down one little mistake like this, which all doctors know is liable to occur, and therefore every precaution is taken to avoid them.

Fig. 15.—Laboratory in connection with Doctor's Office.

Specimens of urine for examination are secured from the men directly in the examining rooms where special arrangements have been made for this purpose. The women's specimens are obtained in the toilet room before going to the examining rooms. A boy and a girl respectively carry these specimens, properly marked, in a covered wire compartment basket to the laboratory.

2. **Blood Analyses.**—Every employee examined whose condition indicates the need of it is given a thorough blood examination in the laboratory on the order of the doctor. This includes red and white count, hemoglobin, differential count, and very frequently a Wassermann test.

3. **Sputum Examination.**—The sputum of suspected tuberculous employees is submitted to repeated examinations. Frequently in cases, clinically tuberculous, as many as ten to twenty sputum examinations are made before the bacilli are found. It is only by using the laboratory to its uttermost in this way that its full value is obtained.

4. **Bacteriological Examinations.**—Frequent use of the laboratory for ascertaining the nature of infections in the surgical cases is resorted

to. But the greatest service has been rendered in the early differential diagnosis between severe tonsillitis and diphtheria. Every case with the least suspicious sore throat is subjected to a bacteriological examination. Smears are examined at once and cultures prepared and incubated both at the plant and at the city health department. An average of one out of twenty of these cultures is positive for diphtheria but in its discovery the fellow employees are protected from this contagion. Many of these cases of diphtheria are very mild for the individual but could be the source of a very severe epidemic among the others.

5. **Stomach Analyses** and **fecal examinations** are occasionally made but usually the employees are referred to an outside laboratory for this work.

In every instance the family physician is given a copy of the laboratory findings in order to aid him in diagnosing and treating the case. The average family physician has not the facilities for making these laboratory tests early in the course of the disease, and they are therefore not usually made until the case becomes serious or evidence of a spread of contagion indicates their need. We are positive therefore that this laboratory has been the means of saving life many times. It is impossible to estimate the amount of lost time from work which it has saved.

Example.—Lulu M., an employee of this concern, became sick one night at home. The third day of her illness the nurse called. She found Lulu suffering from stomach trouble or ptomain poisoning, "the result of eating fish." The family doctor had been in to see her every day. The nurse reported that Lulu seemed very sick and her pain was all localized in her right side. She was sent back the next day and found Lulu's temperature much higher, the pain more severe and the abdomen distended. The family doctor was called but again stated that it was ptomain poisoning and that she would be all right in a few days. The chief surgeon of the plant was informed and he ordered the laboratory attendant to call and make a blood-count. This count showed 26,000 leukocytes. Consultation with the family physician was immediately demanded, and as a result he was convinced of the diagnosis of appendicitis with general peritonitis developing. The girl was referred to another surgeon and operated at once. The abdomen was filled with pus. The appendix was never found. Extensive drainage saved her life, but five months elapsed before she was able to return to work. Her position was one in which an experienced girl meant everything to the work.

Example.—Nellie O., another employee, took sick while at work. She was sent to the doctor's office but wanted to go right home as she was positive her abdominal cramps were due either to her approaching

period or to fish she had eaten at lunch. The nurse, however, persuaded her to be examined. The doctor found tenderness and rigidity over the appendix region. A blood-count was made and showed 18,000 leukocytes. The young lady's family physician was called and acquainted with the facts. As Nellie had been told of the diagnosis and the importance of receiving immediate attention, her doctor suggested that she be sent to the hospital where he was accustomed to work. This was done (a taxicab being used for the purpose), and a nurse went to the girl's home and notified her mother. Four hours later Nellie was operated and a gangrenous appendix removed. She was back at work in three weeks. Nellie's home conditions were known, and the careless attitude of her family toward disease, and there is no question but what weeks of illness, if not her life, were saved by this prompt action.

During 1916 there were 200 cases of appendicitis diagnosed in this way. Some of these, who had no family physician, or were boarding in the city, or for other reasons could not receive proper attention at home, were operated at once by the chief surgeon. The others were referred to their family physicians but were so closely followed up by the medical staff that proper surgical care was soon given in every case. None of these died. During this same period two deaths from appendicitis occurred among employees who had become sick while at home and therefore did not have the advantages of this scientific, diagnostic attention.

Example.—In one department tonsillitis became quite prevalent. The first four cases, however, developed the disease at home. The fifth came to the doctor's office. Smears were taken from the throat but showed nothing suspicious. However, cultures were made. The next morning a diagnosis was made of diphtheria. The family physician was notified and he gave antitoxin treatment at once. A nurse immediately called on the other girls and made smears and cultures. Three of these had diphtheria. The department was fumigated and every throat examined bacteriologically. Only one other case of diphtheria developed, although the people in that department were watched very closely. It is easily conceived that this prompt action aborted a more than incipient epidemic.

An industrial medical and surgical service such as described needs a considerable clerical force to carry on this work. In addition to the medical and nursing staff this office employs one office manager, a private secretary to the chief of staff, four record clerks for the medical cases, one record clerk for the surgical cases, a girl who stamps the coming and going of each patient with a time clock (this is necessary where 500 and more employees visit the doctor's office during the day, to prevent undue loss of time from a patient being overlooked),

and a girl in charge of telephones. Two colored matrons are in constant attendance to keep the offices clean.

While this chapter is dealing with the specific medical and surgical work of an industrial plant, yet it is impossible to draw a line between this work and that of the so-called welfare department in many instances. The two must work in the closest co-operation. For that matter the profession is recognizing more and more the indispensable aid which social workers and all social movements are giving to medical treatment.

Medicine, the exalted, has descended to a human plane, and in the industrial world and in many other places we are witnessing a marriage between medicine and sociology.

In this concern the welfare department (which by the way is not known by that terminology) co-ordinates the work between the safety engineer and the medical staff, and authorizes the changes in plant sanitation recommended by the medical staff. All suggestions along the lines of industrial hygiene and individual hygiene are put into operation or assisted by this department. It provides restaurant service for the employees and supervises the food preparation. It provides recreation rooms for the girls and various kinds of entertainments. For the men athletic fields, tennis courts, ball diamonds, and all types of healthful recreation are under this department's supervision.

Investigations of housing conditions and co-operation with the city authorities and with other industries for the correction of faulty conditions come within the scope of this department and here it has a very definite connection with the medical and surgical work.

Transportation problems, overcrowded street cars, ill-ventilated and cold cars; collection of garbage, cleaning of streets and alleys, sewage conditions, and all public health problems must be entered into by the welfare department, assisted by the medical staff, as a means of maintaining the health standards fixed by this industry.

No system of industrial medicine can be perfected that does not take cognizance of the conditions in the community from whence its employees come.

To the uninitiated, or to the average employer thinking only of production, the large, expensive medical and welfare departments herein outlined seem a rather extravagant, non-producing piece of machinery. No effort will be made to refute this impression, leaving that argument for a subsequent chapter.

This establishment has endeavored to build up a comprehensive system for conserving its human machinery. Even the size of its staff is not sufficient to do all that should be done. For instance, much better results would be obtained if competent medical and surgical care were furnished at a reasonable price to every employee. The nursing

staff should be enlarged so that a visit could be made on every employee the first day of his illness and as often thereafter as was indicated. A nearby hospital for the immediate care of serious cases would be much better than transporting them two or three miles to a general hospital. Many other improvements will suggest themselves to the industrial surgeon.

The following table from the hospital report of this concern demonstrates the need of the present size of its medical staff:

Table 1

SUMMARY REPORT OF WORK OF MEDICAL STAFF

Years	1914	1915	1916	1917
Total number examinations	12,380	16,535	24,826	30,100
Total—Medical cases	23,771	28,009	37,906	37,900
Total—Surgical cases	28,167	25,944	35,216	33,481
Total—Dental cases	391	6,081	8,502	3,746
Total—Nurses visits	5,470	4,702	6,374	6,561
Grand total	70,179	81,271	112,824	111,788[1]

[1] Decrease in amount of work due to reduced staff because of war service.

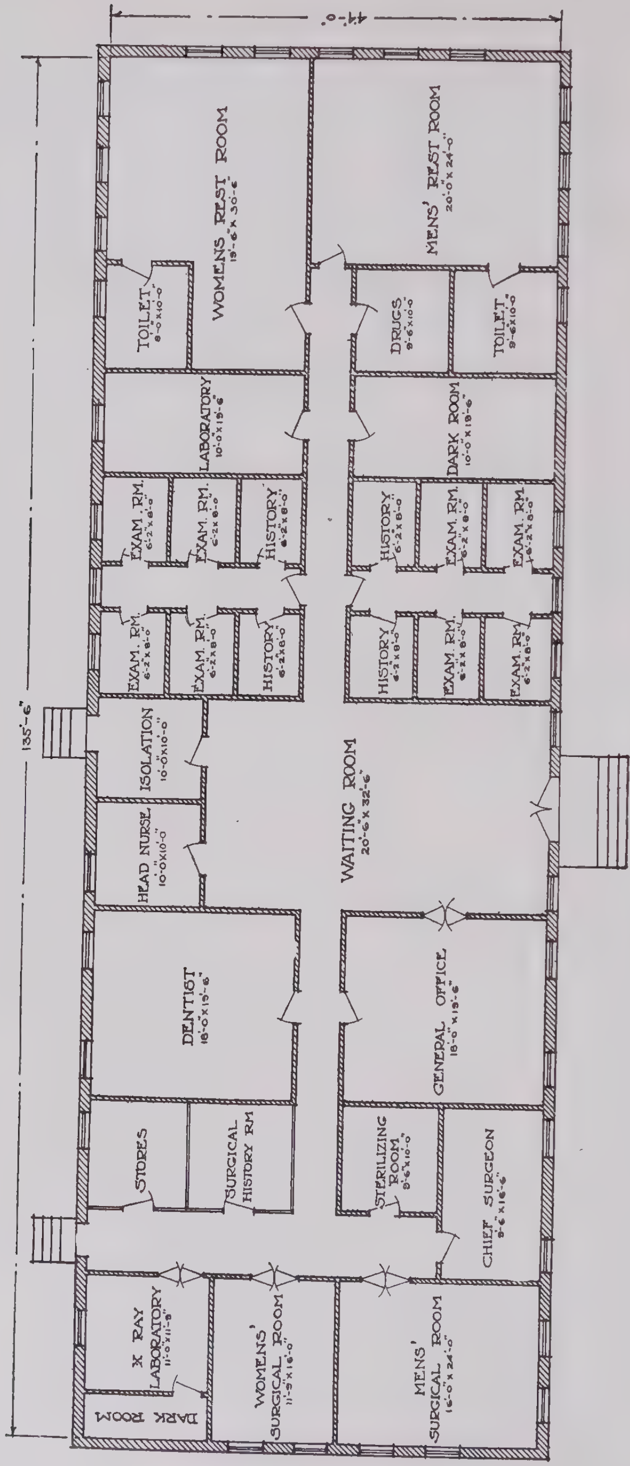

FIG. 16.—Floor plan of an industrial dispensary. This arrangement of the offices will facilitate the work of the medical staff.

CHAPTER VII

BENEFITS AND PROFITS OF THE MEDICAL DEPARTMENT

The ramifications and influences of a genuine human maintenance department in any industry are so intricate and subtle that it is impossible to estimate in dollars and cents the tangible returns from such a system. The salaries of the doctors and nurses, the rental of the office space, the supplies used, the equipment, the outside hospital bills, and all other expenditures can be ascertained to an exactness and represent the cost to the employer of such a department.

But when the employer endeavors to definitely determine or approximately estimate the actual monetary returns from this investment he is soon hopelessly confused.

How can he estimate the financial returns due to the increased efficiency of an employee who for years has been below par because of some chronic ailment which was discovered and removed by the medical department, thereby restoring this man to full producing capacity? During each succeeding year the number of these restored individuals throughout the working force is increased making his problem even harder.

How can he estimate the returns from the cure of hundreds of employees suffering from imaginary diseases? These men and women imagining that they have heart disease, kidney trouble, "displaced" vertebræ, lung trouble, "ulcers," and numerous other conditions, ease-up on their work to protect their health. They move slowly, appear distraught, and worry incessantly over their condition. Some take time from work to go from doctor to doctor, while others shun a physician dreading to have their fears confirmed. These neurasthenics make up a large proportion of the medical work of an industrial dispensary. Their efficiency is greatly reduced but to what extent it is impossible to say. The industrial surgeon examines and re-examines them, gains their confidence, and finally convinces them that no organic disease is present. This may be accomplished at once or it may take weeks of patient psychotherapy. But the buoyant spirits which replace the depression, the added "pep," the increased efficiency resulting, bring great returns to the employer—returns of which he is seldom aware, and cannot compute.

When a foreman is the victim of this neurasthenic condition he

can become a source of great loss to the employer. His worries and depression react on the men and women under him. It is a contagious condition. Many of his employees will develop imaginary ailments. Or the worried foreman grows irritable and is unjust; thus, the labor turn-over in that department increases and the productivity decreases. The foreman is censured by the management and this adds to his nervous condition. An alert industrial surgeon soon learns to recognize such a situation and becomes the efficiency expert who remedies the trouble. But who can estimate the dollar and cent value of such work?

What sum will the employer place in his debit column to represent the increased productivity resulting from the happier, more contented, healthier working force, the direct result of a human maintenance department such as has been described in the preceding chapters? When a concern adopts such a system it is usually due to an awakened conscience, a desire to improve the welfare of its employees. Therefore, many other betterment movements are installed besides the health department. Thus it is often impossible to separate the returns from the medical work from those of other types of welfare work. In a majority of industries, however, the medical department has been the forerunner and incentive for this additional work.

Since our employer is unable to demonstrate actual financial gains from his medical department, it behooves industrial surgeons to show in some concrete form what benefits he may expect from such a system. Since these benefits must react to the good of both the employee and employer before either can receive full compensation, we must show them in terms of both. Table 2 endeavors to do this.

Whenever an elaborate medical system is installed, both the employer and the doctor expect to see, after a year or two, a reduction in the number of cases needing treatment. Both will be disappointed providing the medical department is successful and gains the full confidence of the employees. A medical service which can show such a reduction is failing in its purposes.

It takes at least a year, and usually five years, before the company doctors gain the confidence of the working force. As this confidence increases the number of cases coming to the office for advice or treatment will increase. This is desirable for the greater number of employees visiting the doctor's office affords a correspondingly greater supervision over their health. After a few years these employees develop the habit of coming to the doctor's office for threatened ailments instead of awaiting the full development of some diseased condition. This affords the opportunity of treating sickness in its earliest stage and aborting more serious trouble. The few minutes necessary to visit the doctor's office for this purpose is a great saving of time when

Table 2

HUMAN MAINTENANCE DEPARTMENT

SCOPE OF WORK AND THE BENEFITS

Scope	Benefits: To employees	Benefits: To employer
Medical Supervision		
1. Examination of employees. 2. Examination of applicants. 3. Advising and treating sick. 4. Prevention and treatment of occupational diseases. 5. Prompt care of injured. 6. Preventive Medicine. 7. Preventive Surgery.	1. Discovers disease early—more rapid and surer cure. 2. Discovers organic disease which can be controlled. Prevents overwork and hazardous occupations for these. 3. Prevents disease by discovering focal infections and danger signs. 4. Protection from contagious disease. 5. Suitable work according to physical condition. 6. Prevents accident by removal of cause in employee. 7. Better medical care when sick. 8. Better surgical care when injured. 9. Reduces suffering, permanent disability, and death rate.	1. Reduces time loss due to sickness and epidemics. 2. Reduces compensation for accident disability, deformities and death. 3. Increases output by steadier working force. 4. Decreases hiring of new employees—great financial saving. 5. Increases number of old employees with their constantly increasing value. 6. Increases general efficiency of force. 7. Secures good will of employees.
Plant Sanitation		
1. Sanitation. 2. Ventilation. 3. Lighting. 4. Temperature and humidity. 5. Removal of dust and fumes. 6. Washing, bathing, and toilet facilities.	1. Healthier and better working conditions. 2. Decrease in occupational diseases. 3. Better home conditions—by influence.	1. More energetic employees. 2. More output. 3. Decreases compensation for occupational diseases.

TABLE 2.—(*Continued*)

Scope	Benefits: To employee	Benefits: To employer.
Safety Work		
1. Safety appliances.	1. Protection from accidents.	1. Reduces loss of time due to accidents.
2. Safety committees.	2. Reduces home accidents.	2. Reduces compensation expense.
3. Safety propaganda.	3. Prevents loss of wages.	3. Decreases hospital and doctor bills.
4. Daily inspections.		
5. Investigation of accidents.		
Visiting Nurse's Work		
1. Visiting sick employees.	1. Better care when sick.	1. Reduces loss of time.
2. Nursing aid when needed.	2. Improves home conditions.	2. Shows friendly interest in employee.
3. Assisting medical staff.	3. Decreases wage loss.	
Employees' Advisor's Work		
1. Investigating and correcting (*a*) working conditions; (*b*) home conditions.	1. Increased comfort and happiness.	1. Increases good will and efficiency.
2. Loans for employees.		2. Secures full value of services of all other departments by promoting co-operation.
3. Building and loan work.		
4. Providing a living wage.		
5. Confidential advisor.		

compared with the few days or weeks which may result from neglecting minor symptoms.

These same employees would not seek the counsel of their family physician, because of the expense, for these apparently trivial matters, whereas they will come to the doctor's office providing this confidence is established. With each succeeding year, therefore, the number of medical cases increases. The doctor soon learns to eliminate those who are taking advantage of the system.

The medical cases not only increase but apparently the surgical cases likewise and this in spite of the fact that accident prevention methods are always installed wherever a human maintenance department is in existence. The safety first measures reduce the number of serious accidents, but the minor and so-called trivial injuries are almost impossible to prevent. But we can prevent infections and other serious complications from developing in these minor accidents. Experience has taught us that the greatest safety first measure for these minor injuries is the *immediate reporting* to the surgeon for proper treatment. In a concern, therefore, where the medical department is efficient each year will show an increase in the number of employees reporting for immediate care of all injuries no matter how trivial. In which case, each year will show a corresponding decrease in the number of infections resulting from injuries.

In an industry employing an average of 12,000 men and women, which adopted an efficient medical and surgical system nine years ago, the following table illustrates the increased confidence of the employees, the better medical supervision, and the greater surgical preventive measures which developed with each succeeding year:

Table 3

Year	Number of medical and surgical visits to doctor's office
1909	14,643
1910	17,889
1911	22,400
1912	48,000
1913	56,720
1914	70,179
1915	81,271
1916	112,824

The question naturally arises, did not this great increase in the number of patients using the doctor's office make the cost of such a system prohibitive? The best reply to this question is to submit the following comparative report of the cost of medical and surgical work for two years in this same concern:

Table 4

COST OF MEDICAL AND SURGICAL SUPERVISION OF EMPLOYEES

	1915	1916	Increase, per cent.
Average number employees	11,068	13,324	20.4
Physicians employed full time	0	1	
Physicians employed part time	6	7	16.7
Physicians engaged for call service	1	1	
Nurses employed	12	12	
Surgical and medical cases treated	32,800	43,766	33.4
Redressings	15,447	22,486	45.6
Medical revisits	4,137	6,870	66.1
Total medical and surgical visits to doctor's office	52,384	73,122	39.6
Home visits made by nurses	4,702	6,374	35.6
Home visits made by doctors	174	262	50.6
Hospital visits made by doctors	2,666	3,341	25.3
Physical examinations made	16,535	24,826	50.1
Total medical and surgical cost	\$38,239.59	\$49,075.99	28.3
Average cost per employee	\$3.46	\$3.68	6.4
Total number of patients visiting doctor's office	81,271	112,824	38.8

You will note that the per cent. of increase in the medical staff is below the per cent. of increase in the number of employees. The average amount of increase in the medical and surgical work is 43.2 per cent., while the increase in the total cost is 28.3 per cent. But the actual cost per employee for the year 1916 was only twenty-two cents more than for 1915. A cost of only \$3.68 per employee per year for such an extensive amount of work is certainly not prohibitive.

However, it is impossible to show in dollars and cents what the income amounted to from this work. We can only prophesy and estimate what the loss in time and loss in compensation might have been without it. Some of the sources of profit to this concern from their human maintenance department, however, can be classified as follows:

1. An average of 500 applicants for work per year or 3.4 per cent. who had diseased conditions unfitting them for employment have been weeded out, thus reducing labor turn-over.

2. One hundred and sixty-three cases of active tuberculosis were prevented from being employed during a period of three years, thus protecting the old employees, preventing loss of time due to the spread of the disease, reducing labor turn-over, and eliminating inefficient employees—a group who would have had a gradual, imperceptible slowing-up in their work.

3. Discovering 263 cases of tuberculosis among the old employees

during the same period, the majority of whom were found in the incipient stage, thus accomplishing the same results set forth in 2.

4. During the so-called "grip" epidemic of the winter of 1915 and 1916 the medical work in this concern held the number of absentees down to 9 per cent. of the total working force during a period of four months. Whereas, several concerns had an absentee rate from 25 to 33⅓ per cent. of their total number of employees during that epidemic.

5. Labor turn-over has been reduced to a considerable extent in this industry, but as many other factors enter into this the medical work can only be given credit for a part of this reduction.

6. The number of infections following injuries has been reduced from 28.6 per cent. in 1912 to 7.57 per cent. in 1916. The time lost from infections in 1912 amounted to 1987 days, or an average of 2⅗ days per case, while time loss from this cause in 1916 amounted to 816 days, or an average of 1⅛ days. This was accomplished in spite of the fact that the working force had increased approximately one-fourth during the same period. This represents a saving of some $3000 in wages and approximately $5000 in hospital bills, compensation, etc.

7. Because of this health supervision and preventive surgery a few deaths are prevented every year. On an average of twice every year the medical supervision has prevented this concern from being blamed with a death for which they were in nowise responsible, thus saving either compensation for loss of life or long and expensive litigation.

Example.—The visiting nurse reported that an ex-employee was in a hospital dying. His doctor had diagnosed lead poisoning and blamed his work in the printing department for the condition. Reference to his records showed that he had been examined in the doctor's office several times. A low grade nephritis had been diagnosed. There was also a history of syphilis. The man quit his job, and the company surgeon had lost track of his case for several months. Consultation with the attending physician was sought and granted. The examination of the patient at this time showed a saddle anesthesia, a three plus Wassermann reaction in the spinal fluid, and other symptoms justifying a definite diagnosis of cerebrospinal syphilis. Lead poisoning was ruled out to the satisfaction of his family physician. The man died a few days later. His wife secured a lawyer, but the case was so thoroughly worked up that it was dropped, no effort being made to collect an unjust claim.

Similar cases are very common in the experience of every surgeon in industry, and it is impossible to estimate the savings to their concerns by avoiding compensation and litigation due to these unjust death claims.

One of the greatest sources of saving to the employer is the physical selection of employees for work. *This is done by the physical examination of all applicants for work before employment.* The value to the employer depends upon the thoroughness of these examinations and the amount of co-operation between the employment department, the medical department and the foreman.

The old system in vogue before medical examinations of employees was introduced into industry, and which is still in vogue in so many places, resulted in the following wasteful methods:

1. A man applied to the employment department or to the foreman for a job. He had had words with his foreman in another industry and quit. (This was the result of less and less work due to a physical handicap of which he was not aware.) Experience made him valuable for certain types of work. He was employed and thrown into the human machinery of that industry without any investigation as to his physical fitness. His work was on a machine and was very heavy. He exerted himself to make good and at first succeeded, but gradually the production of his machine fell behind and after two months the foreman was forced to let this man go. For two months an expensive machine had failed to produce sufficiently to pay for its maintenance; a definite loss for the employer. And why? Because this man who was employed blindly had a beginning locomotor ataxia and was physically unable to make good. An examination when he applied would have prevented his employment, saved the loss from inefficient operation of the machine, and the cost of hiring and firing a man.

2. A man was employed as a laborer by an electrical concern. This concern had a medical staff but did not include medical examination of applicants as a part of their work. Therefore, this laborer, without knowing his fitness, was assigned to help repair boilers. After two weeks of work this man suddenly dropped dead. At the time of death he was drawing an electric light attached to a wooden handle into the boiler and in falling this light was broken and a fuse burned out.

At autopsy it was found that this man had an old chronic heart lesion and death was due to acute dilatation of the heart. There was no sign of an electrical burn. But the coincidence of the light breaking and the fuse burning out was seized upon by his relatives and a shyster lawyer and made the basis of a claim before the Employees Compensation Board. Thirty-five hundred dollars was allowed by this Board.

The concern carried the case to court and after a long fight and by employing expert witnesses they were absolved of all responsibility for the man's death.

This blindly hiring of a defective human machine cost this concern over $5000 for two weeks of service.

The placing of all comers on jobs without any effort at a physical selection for their work is responsible for a great financial waste which cannot be shown in dollars and cents but which nevertheless is very evident.

This waste is due to the following:

1. The employment of the physically unfit who later must be discharged because of inability to do the work.

2. The employment of the physically unfit who continue to work for a few months or a year with a gradual decrease in their efficiency due to the advancing disease until finally they are forced to quit work. They have been a source of loss to the concern from the time of their employment.

3. The employment of the physically unfit who because of their condition are subject to frequent accidents. Every accident is a loss to the concern.

4. The employment of the physically unfit who suffer accidents which ordinarily would not be serious but because of the coincidental, unknown physical condition are fatal, or, at least, cause prolonged disability. The loss to concerns from this source is far heavier than any employer is aware of.

5. The employment of the person with some contagious disease who communicates it to others in the working force. The acute contagious diseases are more common, but tuberculosis and syphilis also cause a great loss.

6. The employment of the mentally deficient who never can be fitted to a job and who form a certain percentage of floating labor on account of this fact. An observant industrial physician will pick out this type during the course of his examination.

Those concerns which have an efficient medical system always include the examination of applicants as a definite part of the work. These examinations are not made for the purpose of selecting only the physically fit and refusing employment to all others, but are made for the following purposes:

(*a*) To prevent those with diseased conditions, making work of any kind dangerous to them, from going to work; (*b*) to select proper jobs for those with certain defects where they can still be efficient and yet the work will not be hazardous to them; (*c*) to prevent those with contagious diseases from mingling with the old working force.

The author has collected statistics from ten large industries, having very excellent medical staffs, which examine all applicants for work. Their rejections are based, for the most part, on the above standards. The following table shows the results of these examinations:

Table 5

1. Total number of applicants examined in one year...	118,900
2. Total number employed having disabilities that did not interfere with selected work..................	41,158 or 34.7 per cent.
3. Total number rejected for work because of disabilities	11,433 or 9.7 per cent.
4. Total number having no disabilities of any moment.	66,309 or 55.6 per cent.
5. Total number of regular employees in these ten industries..	102,400

It is fair to assume that these 11,433 applicants who were rejected for work would have soon lost their positions because of inefficiency, or would have quit because of sickness. Certainly by the end of a year practically all of these would have been eliminated from the working force. It is impossible to accurately estimate what the loss to these concerns would have been during that year from having these men and women in their employ. It would have been considerable, however, from decreasing efficiency due to the disease, from an increased accident rate, from loss of time due to sickness and the resulting sick benefits in many cases.

Several estimates have been made of the cost of labor turn-over. These are based on the cost of employing people, teaching them the job, and the time elapsing before they become efficient or productive. These estimates vary from $10.00 to $200.00. One authority, after a careful study of this problem in many industries, gives as a low average the amount of $35.00 as representing the cost of hiring and training an individual.[1]

Therefore, these 11,433 rejected cases can be estimated as saving these concerns $400,155 in labor turn-over.

Magnus Alexander in a comprehensive study of the cost of health supervision in ninety-nine different industries found that the average cost per employee for all medical work was $2.50. Using this figure as a fair average, and taking the regular number of employees as 102,400, we can estimate the cost of the entire medical work in these ten industries at $256,000.

Thus the examination of applicants alone undoubtedly saved these concerns over $140,000 during the course of one year.

Table 6

1. Saving to ten concerns from rejection of physically unfit..........	$400,155
2. Cost of entire medical work in these concerns....................	256,000
3. Profit to the concerns from this one branch of medical work alone...	$144,155

It is fair and conservative to estimate that at least 10 per cent. of those applicants with physical disabilities, who were employed,

[1] A more recent estimate places this at $45.00.

would have quit very shortly if physical selection of the proper job had not been used, thus adding to their efficiency, contentment and health protection. This adds another $144,000 to the profit of the employers from this system.

While the above figures can only be estimated, yet the most skeptical must surely agree that the examination of applicants for work, and the rejection of the physically unfit, even when based on the most humane standards for rejection, certainly pays any concern adopting this method. And the saving to that concern from his procedure alone will more than pay the costs of the most efficient Human Maintenance Department they can establish.

CHAPTER VIII

COST OF THE MEDICAL DEPARTMENT

In the preceding chapter an endeavor was made to show the profit which a concern derives from its human maintenance department and to point out the difficulty of obtaining actual figures on this subject. The cost of maintaining such a department is of equal interest. In fact, it is very essential for an industrial surgeon to have a clear conception of costs in making recommendations to an employer contemplating extending the medical and surgical work in his plant.

Naturally the cost of such a service depends upon many factors. Chief among these are:

1. The caliber of the physicians employed.
2. The number of physicians on the staff.
3. The number of hours the physicians are engaged.
4. The use of outside medical and surgical service.
5. The number of industrial nurses.
6. The number of clerks, stenographers and other lay assistants.
7. The number of employees in the concern.
8. The comprehensiveness and thoroughness of the medical and surgical work.
9. The amount of medical and surgical supplies used.
10. The extent to which laboratory and x-ray methods are employed.

It is quite evident that in estimating the cost of this health service each of the above factors must be considered in connection with each individual concern. However, certain facts and figures can be given which will be of assistance in estimating cost.

The Caliber of the Physicians Employed.—This is one of the most important considerations for the success of the work and the efficiency with which it is done. All industries will find it more effective and much more economical in the long run to employ the best medical and surgical talent which they can secure. By this I do not mean highly specialized physicians to represent each particular specialty of medicine in their plant hospitals, but broad-minded, well-trained, all-around physicians. In addition these doctors should have a highly developed sociological sense and should be filled with enthusiasm for the service which they can render to their fellowmen. The opportunity for service is offered to a greater extent in industrial practice

than in any other line of medicine. It is true that the cost of employing this type of physician is considerably more than to employ a mediocre doctor, but the efficient service, the vision to develop a truly human maintenance system, and the saving in life and limb will more than compensate for this initial expense.

A number of large industries have chief surgeons of this caliber. Some of these men devote their entire time to the work while others give only a part of their time. The salaries paid these full-time men vary from $4000 to $15,000 annually. The part-time men draw annual salaries from $2000 to $10,000 depending largely upon the amount of time devoted to the work.

Industrial concerns cannot expect to secure well-trained physicians at a lower salary. In fact, as our better surgeons take up this work employers are found to be paying greater salaries. While the opportunity for service is abundant in industries, yet human nature is such that the majority desire to be paid for this service. Men who have devoted eight and ten years preparing for their life work at a very great cost naturally will seek that line of work most remunerative.

Too many industries, in the past and even at the present time, are employing company surgeons who have failed to make a success of the practice of medicine or who do not desire to put forth the strenuous effort necessary to make a success. They are paying these men $150 to $250 a month for their full time but frequently fail to get value received.

Not all the poorly paid industrial surgeons belong in this class, for many a well-trained young man takes up this work on a small salary simply as a means of accumulating a little capital which will enable him to enter private practice or some one of the specialties. He renders good service but as soon as financially able he relinquishes the industrial practice. This is a source of great loss to those concerns pursuing such a shortsighted course.

The old time company surgeon who accepted a small fee for emergency work or took a contract, at a low figure, to do only the surgical work for an industry, as a rule rendered very inefficient service to the employees. His standing in the profession was of a very low average and the character of his work was of a low standard. He was a company surgeon in word and deed and too often was only on the side of the employer as represented by the insurance company. The standards of industrial medical and surgical practices as represented by these men reached a very low plane.

Fortunately a few large concerns and some of the insurance companies awakened to the importance of efficient medical care for employees and began to pay for better trained physicians. These men had a vision of the great opportunities for preventive medicine and pre-

ventive surgery offered by industrial medicine, and during the last decade have developed this line of practice into one of the greatest specialties of our profession. And with the industries of the nation devoting more and more attention to the conserving of our man power this specialty will develop far beyond our present dreams. The best medical talent of the country will be brought into this line of work. Their sole effort will be devoted to the welfare of the employee, but it will be retroactive to the welfare of the employer. The old type employer's physician is passing and the new era of the employee's physician is here.

The Number of Physicians on the Staff and the Number of Hours Spent on the Job.—Among the leading surgeons in industry opinion is divided as to the number of hours the company physician should spend on the job. Some advocate the full-time doctor while others favor the part-time plan.

Unfortunately in the past too many of the full-time physicians have been underpaid, have been held too closely to the plant, preventing their scientific development, and have settled into a "rut." Such a policy has deterred the best trained men from taking a full-time position. A few industries, willing to pay for the best of service, have been able to secure and hold men of the highest professional standing who give their entire time to this work. The strongest argument for such a plan is the doctor's undivided attention devoted to the employees.

Very few industries are willing to pay a salary commensurate to what a well-trained, scientific physician can earn in private practice. They can secure, however, the services of such a man for part time, leaving him free to develop his special practice on the outside. Thus doctors who have been thoroughly trained in every branch of medicine and surgery, but who are developing a specialty, will accept a part-time position. In this way a group of specialists can be gathered together in the plant hospital, who make a diagnostic and treatment group far superior to the majority of full-time staffs. If they are paid sufficiently well for this part-time work, most of these men will remain with the concerns for years—each succeeding year becoming more and more valuable to them as a specialist.

The full-time staff will find it necessary to consult outside specialists more frequently than a part-time staff composed of men thoroughly qualified to represent some special line of practice. For example, one large industry employs ten physicians including the chief surgeon, all of whom spend three and one-half hours at the plant. During this time they work at a pace it would be impossible to continue for the entire day. Among these doctors are represented the following specialties: surgery, orthopedics, gynecology, internal medicine, tuberculosis,

psychiatry, dermatology, and an expert laboratory man. They are not so highly specialized, however, that they are not efficient as examiners and general emergency men. All of them, from the very nature of the work, are highly specialized in preventive medicine and preventive surgery which after all is the very backbone of industrial medicine and surgery. It would be financially prohibitive for this industry to employ half of this staff for full-time work, whereas, by the part-time system they are able to avail themselves of the best type of special service whenever needed.

These nine assistants receive an average of $150 per month for the three and one-half hours work per day at the plant. They are free to care for any member of the family of an employee but are prohibited from accepting as a private pay patient any one of the employees. This is very essential as it removes the danger of a physician soliciting patients from among those whom he must advise to seek certain medical or surgical remedial measures. It adds to the weight of the physician's advice when no ulterior motive can be connected with it.

Number of Physicians Needed.—For a comprehensive system of industrial medicine and surgery at least one full-time or two part-time physicians for a thousand employees is necessary. Three full-time or five part-time physicians or eight part-time physicians are needed for a working force of 8000 to 12,000.

If applicants are not examined for work or if re-examinations are not made frequently, or if other phases of a comprehensive system are not incorporated in the work, the number of physicians can be reduced.

The Number of Industrial Nurses Employed.—These nurses are the most valuable assistants to the doctors and are necessary to carry on any efficient system of industrial medicine. The above estimate of doctors needed depends upon the employment of these nurses. Besides assisting the medical staff they must act as visiting nurses to the sick and injured employees. They are the best means of constantly keeping in touch with the absent employees.

Two nurses for 1000 employees are essential. Three to four nurses are needed up to 5000 employees. Five to eight nurses for 5000 to 10,000, and as many as twelve nurses for at least 15,000 employees will be necessary. If all sick employees are to be visited, however, the above number of nurses should be doubled.

The number of lay assistants will depend upon the completeness of the records and files. Money expended for keeping up-to-date records on all patients visiting the doctor's office is money well spent by the concern. These records furnish valuable comparative data from year to year and will enable the discovery of many conditions

effecting the health of employees which can be corrected. One stenographer and one filing clerk are necessary for each 2000 employees.

In one industry where from 600 to 800 workers per day visited the doctor's office during the busy months it was found to be most economical to employ a girl time keeper in the waiting room. It was her duty to stamp on the hospital pass, with a time clock, the hour of admission to the office of every employee and the hour of leaving. In this way the employees were seen in turn and none were allowed to waste an undue amount of time waiting for the attention of the doctor. On the busiest day of last year with an average of four doctors and eight nurses on the job all the time one employee passed through the office every half minute. Every one of these were seen by either a doctor or nurse, and notation of what was done placed upon the employee's record.

This office employs eleven lay assistants, girls, thus making possible a system which can efficiently handle such a large number of cases. The average salary paid these girls is $15 a week.

The total cost increases with the number of employees but as a rule the average cost of this work per person decreases with every thousand employees. This is shown very well in the accompanying table.

Also, the outlay increases with the hazardousness of the occupations. Thus, the cost of such a system is greater in a manufacturing plant than in a mercantile concern. The increased amount of surgical supplies alone is responsible for a greater expense.

The comprehensiveness and thoroughness of the work depends largely upon the caliber of the medical men employed. Good scientific physicians will demand and use a laboratory and the *x*-ray more than in a plant where slip-shod methods are tolerated. All of this will increase the immediate costs but the results obtained will far more than compensate a concern for the additional expense.

Cost of Health Supervision in Industry.—The Conference Board of Physicians in Industrial Practice, composed of industrial surgeons representing many of the largest industries of the eastern states, has contributed much valuable material to Industrial Medicine and Surgery. Magnus W. Alexander, Secretary of this Board, is responsible for the compilation of the attached table showing the cost of health supervision in industries. The author is indebted to Mr. Alexander for the privilege of reprinting this material.

"The accompanying table presents data for the year 1916 as reported by ninety-nine industrial plants located in fifteen states. The total average number of employees represented was 495,544; the average number per plant was 5005, the maximum 37,107, the minimum 141.

"While the average cost per person as indicated in the summary, is $2.50, it is not representative, as the total cost on which the average is based includes that of four plants (71, 85, 95 and 96) which render unusual service, giving both medical and surgical attention to their employees at the plant and in their homes as well, besides assuming the medical care of employees' families. Omitting these four plants from consideration, the average cost for the 479,634 employees in the other 95 plants was $2.21.

"A total of 3,165,114 cases was reported, an average of more than six cases per person employed, at an average cost of thirty-nine cents per case. The number of cases reported, however, does not include all of the service rendered. In many plants, no record is kept of slight injuries, of injuries redressed, of medical cases treated, of home visits made, or of physical examinations. In others, even the most trivial cases are counted. Furthermore, as 'cases' are so varied in gravity and in the time required for treatment, any comparisons of costs per case are not of much value.

"The 'Total Medical and Surgical Cost' includes salaries of physicians and nurses, cost of outside medical and surgical service and cost of medical and surgical supplies, whether or not paid for by insurance companies as a part of the insurance contract; it excludes all compensation for injuries, all overhead expenses and any wages paid to employees while off duty to have their injuries treated.

The chief significance of this data, from a general viewpoint, is that it is possible to give such a large amount of medical and surgical service at a cost which averages only $2.21 per employee per year.

Convincing proof of the economic value of health supervision in industry is afforded by the fact that, when collecting the data contained in this report, it was found that no employer had abandoned the health supervision activities established in his plant. On the contrary, the prevailing tendency has been to invest even more money in extending the service."

TABLE 7.—COST OF HEALTH SUPERVISION.

	Plant Number	Average Number of Employees	Physicians Employed Full Time	Physicians Employed Part Time	Physicians Engaged for Call Service	Nurses Employed M—Male F—Female	Others Employed	Surgical Cases Treated	Medical Cases Treated	Redressings Made	Home Visits Made	Physical Examinations Made	Total Cases of all Kinds	Total Medical and Surgical Cost	Average Cost per Employee	Plant Number
Metal Trades	1	400	0	0	1	0	1 first-aider	240	240	80	0	0	560	$2,000	$5.00	1
	2	500	0	0	2	0	1 attendant	1,451	506	654	...	...	2,611	692	1.38	2
	3	720	0	0	1	0	0	300	0	...	...	0	300	2,651	3.68	3
	4	762	0	1 4 hrs. daily	0	1 F.	1 boy	2,032	895	1,399	17	1,715	6,057	3,112	4.08	4
	5	776	0	1 5 hrs. daily	1	1 M.	2 first aiders	7,543	255	6,117	36	40	13,991	5,744	7.40	5
	6	875	0	0	1	1 F.	0	715	150	4,127	...	...	4,992	1,297	1.48	6
	7	918	0	1 2 hrs. daily	0	0	0	696	0	4,000	15	563	5,274	1,925	2.10	7
	8	1,000	0	0	1	0	0	1,618	388	...	...	0	2,006	1,038	1.04	8
	9	1,100	0	0	Yes	2 F.	0	959	0	678	204	1,500	3,341	3,160	2.87	9
	10	1,157	0	1	7	2 F.	1 first aider	327	1,382	970	...	...	2,679	5,878	5.08	10
	11	1,244	0	1 daily	0	2 F.	0	7,984	2,400	...	200	40	10,624	4,040	3.25	11
	12	1,561	0	0	1	1 F.	0	5,332	3,802	3,826	0	0	12,960	1,332	.85	12
	13	1,730	0	1 2 hrs. daily	0	1 M.	1 stenographer	2,660	...	4,872	144	2,782	10,458	3,485	2.01	13
	14	1,928	0	1 1½hrs. daily	0	1 F.	Part time clerk	2,628	572	6,416	716	...	10,332	4,939	2.56	14
	15	2,000	0	0	0	1 M.	0	3,000	...	936	144	0	4,080	2,330	1.16	15
	16	2,200	0	0	0	0	1 first aider	1,294	0	0	0	0	1,294	1,165	.53	16
	17	2,400	0	0	0	1 M.	0	7,200	1,000	3,200	0	0	11,400	5,250	2.19	17
	18	2,565	0	0	0	2 F.	0	6,657	...	11,163	...	0	17,820	4,074	1.58	18
	19	2,600	1	0	0	1 F.	0	1,628	1,772	812	112	176	4,500	3,040	1.17	19
	20	2,862	0	4 4 hrs. daily	4	2 M.	1 stenographer	4,596	(1)	17,948	148	5,516	28,208	9,068	3.17	20
	21	3,097	1	1 daily	0	0	1 clerk	3,098	220	4,350	20	0	7,688	4,491	1.45	21
	22	3,250	1	0	Yes	1 M., 1 F.	0	1,648	990	13,844	...	12,117	28,599	7,517	2.31	22
	23	3,503	0	0	Yes	1 F.	0	318	0	0	0	0	318	3,550	1.01	23
	24	3,794	1	0	0	2 M., 1 F.	1 clerk	25,782	(1)	32,688	...	...	58,470	8,820	2.32	24
	25	4,000	1	0	Yes	2 M.	0	1,280	(2)	24,000	380	8,000	33,660	10,980	2.74	25
	26	4,534	0	2 2 hrs. daily	0	2 M.	0	6,522	0	10,000	1,000	4,278	21,800	11,376	2.51	26
	27	4,848	1	1 1 hr. daily	2	1 M., 3 F.	1 clerk	2,360	4,944	3,850	3,962	6,246	21,362	15,494	3.20	27
	28	5,300	0	0	8	1 F.	4 first aiders	1,109	(1)	4,671	...	0	5,780	5,157	.97	28
	29	5,655	0	1 1 hr. daily	Yes	1 M.	1 clerk	3,968	4,843	4,433	0	1,000	14,244	5,728	1.01	29
	30	5,809	3	0	0	1 F.	2 first aiders	15,992	...	15,188	0	7,864	39,044	8,272	1.42	30
	31	6,000	1	1	0	2 F.	3 (3)	14,394	11,772	17,416	0	1,004	44,586	7,074	1.18	31
	32	6,727	0	0	2	1 F.	0	10,580	...	14,000	...	0	24,580	7,713	1.15	32
	33	6,806	0	0	1	1 F.	1 steward	5,194	2,012	7,417	64	7,000	21,687	9,646	1.42	33
	34	7,608	0	6 6 hrs. daily	0	0	5 (4)	15,659	2,998	53,252	65	23,136	95,110	19,897	2.62	34
	35	7,745	2	0	0	1 F.	3 (5)	3,164	848	5,349	584	1,970	11,915	9,002	1.16	35
	36	7,922	1	1 3 hrs. daily	0	5 F.	1 stenographer	8,122	18,644	7,254	406	6,388	40,814	14,997	1.89	36
	37	8,000	4	0	0	5 M.	2 clerks	1,327	30,500	2,745	1,078	15,565	51,215	18,897	2.36	37
	38	10,000	3	0	1	2 F.	1 stenographer	23,112	9,350	42,972	1,724	25,458	102,616	17,680	1.77	38
	39	11,000	0	1 1 hr. daily	0	1 M., 4 F.	6 (6)	17,516	...	39,931	...	...	57,447	17,267	1.57	39
	40	12,786	2	0	0	1 M., 2 F.	0	11,177	1,526	24,502	1,719	17,318	56,242	13,641	1.07	40
	41	14,500	5	0	0	9 F.	7 (7)	9,600	3,800	32,000	3,000	18,600	67,000	30,200	2.08	41
	42	15,793	1	0	0	4 M., 2 F.	1 attendant	32,160	(1)	36,676	1,032	0	69,868	32,961	2.09	42
	43	16,776	12	0	Yes	5 F.	(8)	53,006	54,273	62,891	(9)	16,000	186,170	28,749	1.71	43
	44	16,880	5	0	0	1 M., 10 F.	0	29,626	...	71,914	...	5,749	107,289	34,409	2.04	44
	45	17,387	2	0	Yes	5 M., 1 F.	0	12,200	742	32,364	1,110	15,648	62,064	22,650	1.30	45
	46	18,521	2	0	0	6 M., 5 F.	5 (10)	55,728	(1)	83,648	0	0	139,376	21,606	1.16	46
	47	37,107	9	0	0	24 M.	(11)	86,611	133,036	202,095	3,643	41,175	466,560	87,717	2.36	47
Rolling Mills	48	1,321	1	0	1	3 M.	0	3,165	17	6,538	19	3,514	13,253	4,130	3.13	48
Rolling Mills, Brass	49	2,653	1	0	0	0	3	8,918	1,118	37,746	970	0	48,752	9,113	3.48	49
	50	2,700	0	0	2	1 M., 1 F.	1 supervisor	2,880	...	8,092	1,364	0	12,336	5,606	2.08	50
	51	4,500	0	0	Yes	2 F.	3	16,463	32	37,492	0	0	53,987	16,084	3.57	51
	52	4,910	0	0	Yes	1 F.	3	12,001	0	40,642	849	0	53,492	11,010	2.24	52
	53	8,233	4	4	0	8 F.	(12)	21,590	5,098	40,602	640	18,624	86,554	36,104	4.39	53
	54	25,000	0	Yes	0	2 M., 11 F.	Orderlies	30,000	0	60,000	200	0	90,200	55,000	2.20	54
Smelting & Refining	55	1,270	0	1 1 hr. daily	0	0	24 first aiders	326	950	1,196	360	0	2,832	6,932	5.46	55
Light and Power	56	1,061	0	Yes	0	0	0	177	0	0	0	440	617	2,020	1.90	56
	57	2,200	1	0	Yes	2 F.	2 clerks	172	2,800	633	3,300	960	7,865	8,200	3.73	57
	58	3,027	4	0	0	0	0	918	0	2,033	1,525	1,245	5,721	10,700	3.53	58
	59	3,050	2	0	Yes	0	0	200	1,500	2,000	200	2,357	6,257	5,959	1.95	59
	60	4,782	0	1 3½ hrs. d'ly	0	1 F.	0	18,910	(1)	(1)	...	...	18,910	28,923	6.05	60
	61	4,850	1	2 4 hrs. daily	Yes	2 F.	0	920	1,088	2,718	338	3,500	8,564	12,919	2.66	61
	62	5,951	0	0	4	0	0	1,112	...	...	...	0	1,112	23,880	4.01	62
Transportation	63	1,825	0	1 2 hrs. daily	10	0	0	416	404	1,456	20	1,754	4,050	3,105	1.70	63
	64	4,500	1	1 4 hrs. daily	15	0	1 sten. 1 first aider	2,062	425	(1)	20	4,746	7,253	5,155	1.15	64
	65	9,420	0	3 3 hrs. daily	Yes	2 F.	(13)	4,080	0	11,697	406	11,314	27,497	19,212	2.04	65
	66	10,000	0	6 3 hrs. daily	Yes	2 F.	(13)	5,694	0	15,413	1,148	11,072	33,327	29,507	2.95	66
	67	10,050	3	0	12	1 F.	1 clerk	1,978	20	5,934	225	1,307	9,464	12,654	1.26	67
Chemicals	68	311	0	0	1	0	3 first aiders	186	0	928	18	0	1,132	1,540	4.95	68
	69	600	0	1 4 hrs. daily	0	1 M.	(14)	1,451	1,930	10,835	508	424	15,148	3,174	4.60	69
	70	1,000	1	0	Yes	1 F.	0	1,292	2,430	3,303	13	9	7,047	4,122	4.12	70
	71	1,060	1	0	1	0	3 first aiders	5,353	1,271	8,207	1,303	1,709	17,843	6,848	(15)6.46	71
	72	1,908	2	0	0	1 F.	1 inspector	1,466	...	5,200	850	885	8,401	4,931	2.58	72
	73	5,603	3	1	0	3 F.	0	2,573	6,801	6,225	6,428	7,146	29,173	14,182	2.53	73
Food	74	1,200	0	1 4 hrs. daily	0	1 F.	1 surg. part time	12,379	2,096	7,147	6	776	22,404	5,400	4.50	74
	75	1,500	0	1 4 hrs. daily	2	0	0	...	...	...	...	...	...	2,835	1.89	75
	76	2,500	0	0	0	0	0	1,512	438	3,618	1,278	1,734	8,580	9,018	3.61	76
	77	3,000	0	0	Yes	2 F.	0	2,669	0	500	...	0	3,169	10,072	3.36	77
	78	5,450	2	0	Yes	2 F.	1 clerk	12,492	0	13,920	5,000	4,000	35,412	12,550	2.30	78
Rubber	79	1,650	0	1 2 hrs. daily	0	2 F.	0	1,500	1,020	3,240	180	0	5,940	2,460	1.49	79
	80	3,000	1	2	0	2 F.	2 clerks	10,369	1,250	27,000	350	2,200	41,169	11,725	3.91	80
	81	4,756	2	0	0	1 M., 2 F.	2 clerks	6,200	7,840	8,600	...	0	22,640	5,200	1.09	81
	82	5,000	2	0	0	1 M., 2 F.	1 stenographer	480	9,400	3,240	60	300	13,480	4,800	.96	82
	83	13,036	11	2	0	3 M., 16 F.	clerks	31,772	...	54,876	35,148	29,044	150,840	51,004	3.98	83
Textiles	84	1,000	0	1 semi-weekly	0	1 F.	0	241	...	1,359	523	1,585	3,708	1,563	1.56	84
	85	1,350	1	1 6 hrs. daily	7	2 F.	2 cleaners	1,000	15,000	300	8,000	0	24,300	5,250	(16)3.89	85
	86	2,000	1	0	1	1 F.	3 attendants	2,064	852	3,684	288	300	7,188	5,361	2.68	86
	87	4,589	1	3 semi-weekly	0	2 F.	2 cl'k, 1 cleaner	5,856	(2)	15,452	5,800	5,076	32,184	12,000	2.62	87
Paint	88	1,226	1	1	0	0	1 at'n'dt 1 sten	...	...	...	370	6,092	6,462	9,683	7.90	88
	89	2,797	0	0	18	0	0	1,609	2,184	...	...	...	3,793	19,952	7.13	89
Leather	90	1,122	0	1 4 hrs. daily	0	0	1 first aider	83	1,032	0	382	0	1,497	3,540	3.15	90
	91	1,904	0	1 1½ hrs. tri-weekly	1	2 M.	1 boy	1,646	...	2,697	0	3,600	7,943	2,562	1.35	91
Publishing	92	141	0	0	1	0	0	314	0	20	0	0	334	56	.40	92
	93	3,217	0	1 3 hrs. daily	0	1 F.	3	1,648	...	3,232	0	1,528	6,408	3,417	1.06	93
Coal Mining	94	2,454	0	0	3	0	0	577	12	1,690	313	250	2,842	4,637	1.89	94
Gold Mining	95	2,500	7	1	0	7 F.	4	1,443	199	40,204	20,280	0	62,126	35,590	(16) 14.24	95
Coal and Iron Mining	96	11,000	3	34	0	49	(17)	7,430	96,795	...	...	27,673	131,898	130,000	(16) 11.82	96
Miscellaneous	97	550	0	1 1 hr. daily	0	0	1 first aider	520	100	1,076	24	0	1,720	808	1.47	97
	98	800	0	1 2 hrs. daily	0	1 F.	0	617	1,424	900	20	1,512	4,473	1,916	2.39	98
	99	1,261	0	1 5 hrs. daily	1	0	0	418	3,244	1,158	6	0	4,826	3,402	2.70	99

SUMMARY

INDUSTRY	Number of Establishments Represented	Total Average Number of Employees Supervised	Total Cases of all Kinds	Total Medical and Surgical Cost	Average Annual Cost of Medical and Surgical Supervision per Employee
Metal Trades	47	294,646	1,988,991	$541,771	$1.84
Rolling Mills	7	49,317	358,574	137,047	2.78
Smelting and Refining	1	1,270	2,832	6,932	5.46
Light and Power	7	24,921	49,046	92,601	3.72
Transportation	5	35,795	81,591	69,633	1.95
Chemicals	6	10,572	78,744	34,797	3.29
Food	5	13,650	69,565	39,875	2.92
Rubber	5	27,462	234,069	76,089	2.77
Textiles	4	8,939	67,380	24,177	2.70
Paint	2	4,023	10,255	29,635	7.37
Leather	2	3,026	9,440	6,102	2.02
Publishing	2	3,358	6,742	3,473	1.03
Coal Mining	1	2,454	2,842	4,637	1.89
Gold Mining	1	2,500	62,126	35,590	([10])14.24
Coal and Iron Mining	1	11,000	131,898	130,000	([10])11.82
Miscellaneous	3	2,611	11,019	6,126	2.35
	[illegible]	495,544	3,165,114	$1,238,485	*$2.50

*The average annual cost per employee, excluding Plants Nos. 71, 85, 95, and 96, for which the cost includes sickness treatment of employees and their families at home, was $2.21.

CHAPTER IX

SUPERVISION OF THE HEALTH OF THE MANAGERIAL STAFF

The human maintenance department should not be operated only for the employees; the managerial staff of the concern should likewise be included in its scope. The supervision of the health of the president, the vice-president, the general manager, and of all the department managers is of equal or greater economic importance to the industry.

Every industrial surgeon agrees that the success of his work depends upon interesting the head of the concern and securing his co-operation. Many surgeons insist upon reporting direct to the chief executive, or his highest representative, depending upon this as the best means of securing the indorsement and assistance of the managers.

Too often the physician fails to take advantage of this opportunity by neglecting to offer this medical supervision to the managerial force. On the other hand, the attitude of these managers is often inconsistent. They will lend every assistance toward extending the work to the employees but refuse to apply it to themselves.

Some executives and managers have adopted the principle that all work and no play does not pay dividends and for these the supervision is not so essential. But the majority of busy business men are over-burdened with work, are irregular in their habits, eating at all hours, sleeping too little, and failing to take sufficient exercise. They work at high tension and develop a high tension machine. They depend upon their few weeks' vacation once a year in which to recuperate their wasting energies.

None of these practical business men would think of working an expensive, high powered machine day in and day out without periodically inspecting it and repairing damaged parts before the machine was ruined. They should give the same attention to the human mechanism.

Many of these men develop circulatory conditions or damaged nervous systems which totally unfit them for further service, often prematurely. In this way the concern suffers the loss of a valuable executive—a loss which the industrial surgeon might prevent.

Therefore, the medical staff should extend its work to include everybody from the president of the concern down to the lowest em-

ployee. In a few places this is done with the result that the managerial staff sets the example for the rank and file of the employees. When it is necessary for the entire force to be vaccinated the president and general manager are the first to submit to the operation. When the president and the managers undergo a periodical medical examination and talk about it freely it is an easy matter to win over the rest of the force to such a procedure and to gain their confidence. But aside from the example it is of the greatest value to these executives to develop habits of prevention. They owe it to themselves, to their families and to the business which they represent.

The periodical medical examination and the resulting health supervision should be applied to the executives and all the department managers of every industry. At least twice a year these officials should be thoroughly examined; this should include urinalysis and blood-pressure tests. If the examination reveals the need of a more thorough study, the same should be made at once. It is necessary to maintain a tickler system on these officials, calling them to the office for examination when their turn arrives. This should not be left to their memory.

Great care and diplomacy must be exercised in telling these men of any little condition which is found and which needs some corrective treatment. These officials very frequently become panicky over some minor condition, developing a real neurasthenia because of the suggestion contained in some warning which the doctor gives. This is often truer of managers than of the employees in the ranks. It may be due to the high tension at which they live and work, or to the responsibilities which rest upon them, or more probably to the fact that they can afford to go from doctor to doctor, trying to find one who will confirm their worst fears.

The case of Manager P. illustrates this point very forcibly. On the managers' tickler system it was Mr. P.'s day to be examined. He was called to the office and the physical examination made which showed Mr. P. perfectly normal physically. However, he was tired and nervous and complained of stomach trouble. In a manner he censured the doctor for not discovering the condition.

Undiplomatically the company physician said, "Well, you had better go and have a stomach analysis made."

Instead of following up the case and reassuring this tired manager the doctor let him depart unsatisfied.

Mr. P. went to his family physician who did not make a stomach analysis but who agreed with his patient's diagnosis of stomach trouble. Mr. P. was not satisfied, however, because he was still thinking of that "stomach analysis" suggested by the company doctor.

He finally went to a specialist who for $25 made the analysis and

while it failed to show anything definite yet the specialist suggested further study to rule out the possibility of cancer. Poor Mr. P. became panicky and started to jump from doctor to doctor most of whom reassured him and laughed at his fears. He was unconsciously looking for the doctor who would agree with his own diagnosis of his case. After three months the general superintendent of this concern called up the company surgeon and asked what was the matter with manager P. who was falling down in his work and whose department was going to pieces.

The doctor had not seen Mr. P. for three months but he would do so at once.

Mr. P. was called to the office. After two weeks of careful study, and patiently demonstrating to the man that he did not have a cancer, the doctor was able to enter into the status of the case at the point where he should have started three months previously at the first examination.

Mr. P.'s first symptoms were tiredness, nervousness and a "funny, sick feeling" in the stomach. The doctor after gaining his confidence, found that the production in his department had fallen off, that the general superintendent had had Mr. P. "on the carpet" a number of times, causing fear of losing his job. This fear was the etiologic factor and beginning of his entire trouble.

The general superintendent when informed of the condition removed the fear, a short vacation was prescribed which was spent at hard work on a farm, and Mr. P. returned a month later a well man and with no thought ever given to whether he had a stomach or not.

Not only the managers but all the employees learn to lean upon the medical staff for advice and guidance concerning their health. Many foolish fears and symptoms are brought to the attention of these doctors. Every case must be considered carefully and seriously treated, no matter how trivial it may seem to the doctor. Only in this way can you avoid the panic which overcame Mr. P. and the resulting economic loss to his industry.

Besides examining and advising these managers on health matters the medical staff should take an interest in seeing that healthful recreation and exercise is provided for them as well as for the employees. Some concerns insist on their managers taking one afternoon a week to play golf. Others provide tennis courts about the plant grounds for the use of the managers. These arrangements are of great aid in the months when least needed. In the winter months the lack of healthful exercise is most apparent. Steps should be taken by every concern to meet this condition.

One industry has provided a gymnasium for its executive and managerial staff. This gym contains the usual apparatus for exercise, a

shower bath, needle bath, electric cabinet and table for a thorough rub down. A physical director is in attendance at all times.

The managers have their regular period each day for reporting here for a short work out. The president and vice-president of this concern are the most faithful followers of this plan and use their influence to see that every manager takes advantage of the gymnasium.

Supervision of the health of the managerial staff should be a very definite part of the work of the industrial physician and surgeon in every concern. It will do more than anything else to prevent the frequent and unnecessary nervous breakdowns which are entirely too prevalent among the busy business men of to-day.

CHAPTER X

RECREATION AND EXERCISE AS RELATED TO SUPERVISION OF HEALTH OF EMPLOYEES

In many up-to-date industries much attention is devoted to proper recreation and physical exercise for the employees. This is true in industries where medical departments have never been installed. In others with excellent medical staffs this health adjunct is neglected; or, if it exists, it is not considered in any way related to the medical service. Too often the provisions for recreation and playgrounds are left to the welfare department or to employees' committees, and the plant physicians take no interest in the work.

No better health movement can be inaugurated by any concern for its employees than by providing proper facilities for recreation and exercise in close proximity to the working place. Besides proving of healthful benefit such an interest displayed by the employers tends to create a loyalty and good fellowship among the employees themselves.

In all industries the medical departments should take a very active part in the formation and maintenance of all movements for the recreation and physical exercise of employees.

These recreational movements have taken many and varied forms. In some cases they are not only for the benefit of the employees but for their families likewise. Their purposes are diversional, educational, healthful and to develop loyalty toward the industry. They are carried on in connection with the plant itself, in the grounds about the plant, in halls provided for the purpose, in Y. M. C. A.'s, or gymnasiums built near the plant, and may be extended to the schools and churches of the community where the industry is the means of stimulating them.

The following examples of recreation for the employees are more purely diversional and educational and therefore are not so closely related to the medical department. Activity in them by the doctors and nurses, however, increases the influence and standing of the medical staff with both the employees and employers.

Motion picture shows.

Picnics for the employees.

Boat and train excursions.

Lectures and concerts.

Dances and parties.

FIG. 17.—Y. M. C. A. in connection with a large industry. This furnishes recreation, physical development and night school classes.

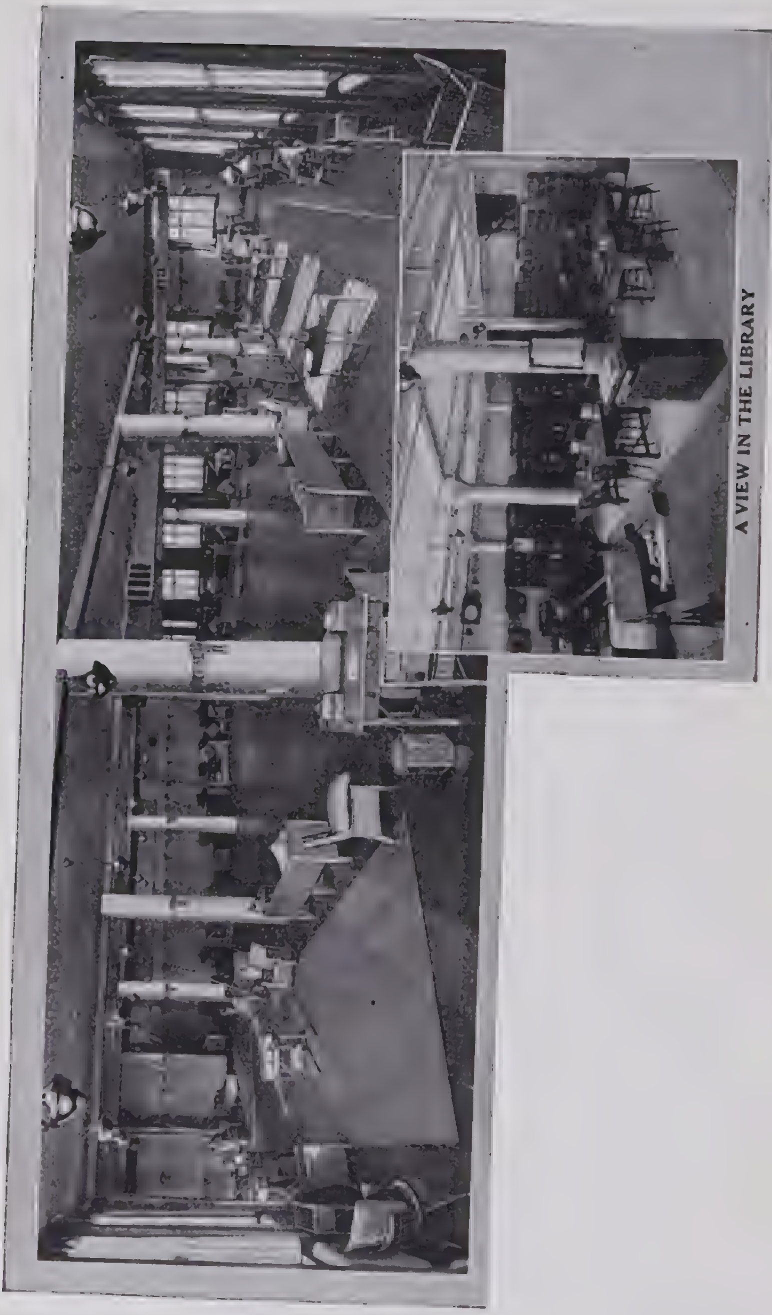

Fig. 18.—A recreation room for girl employees.

Sewing and cooking classes.

Libraries and plant journal.

Advantage can be taken of the motion picture shows, the lectures and the plant journal as a means of injecting snappy health talks or demonstration of disease and accident prevention methods into the minds of the employees. These are very effective measures especially when introduced as a part of a purely recreational program.

The recreations tending to improve the health of the employees are the ones in which the medical staff should take the greatest interest. These are:

1. **Physical Drills or Exercise Conducted During Working Hours.**—Much benefit is gained for employees and their working capacity is increased especially where their work is sedentary, if ten minutes every two hours are devoted to physical exercise.

The windows should be thrown wide open and the employees put through a drill or calisthenic movements. Deep breathing exercises should always be included. Every department manager should be given instructions in proper exercises by a well trained physical director so he or she can conduct these recreational periods. There is nothing which tends to overcome the loss of efficiency from fatigue as much as this. The employees should be urged to go through similar setting up exercises on arising in the morning.

2. **The Recreation Room.**—Many industries have built in connection with their plants large club rooms—one for women and one for men. Here reading and writing rooms are provided, gymnasiums with all kinds of appliances are furnished and the rooms may be used as meeting halls for shows, lectures, dances, etc. The doctor should stimulate the physical exercise features of these recreational rooms. He should also see that they are light, airy and clean at all times (Fig. 18).

Often a prescription providing for certain hours spent in the gym will do far more toward overcoming some threatened disease or breakdown in an employee than a prescription for iron, quinine and strychnia. In fact the more of these healthful adjuncts the physician can add to his armamentarium the less drugs will he dispense.

3. **The Playgrounds and Athletic Fields.**—Our colleges were the first to recognize an athletic field as a definite and essential part of the educational plant. To-day many industries have adopted the idea and have provided ball grounds, tennis courts, cinder tracks, and all the appliances that make up a regular athletic field (Fig. 19).[1]

Teams are organized in various departments and compete with one another. Much friendly rivalry is developed. The silver cups won by department teams in tennis, the baseball pennants won, and

[1] Figs. 17 to 19 by courtesy of Sears, Roebuck & Co.

Fig. 19.—Views from the athletic field.

the individual medals and prizes stimulate these athletic contests and make them very popular with the employees.

These provisions for outdoor athletics are of great aid to the medical department. Many a hollow chested, shallow breathing, stoop shouldered employee who is frequently absent on account of minor ailments can be broadened out into a well man by persuading him to use the athletic field. Many of these boys began work very young and never had the advantages of athletic training at school or college. They enter into the sport with all the enthusiasm of a freshman.

Besides invigorated bodies, their minds are benefited. For the first time the spirit of perseverance and conquest is instilled into them. The joy of winning on the athletic field is an incentive to strive to win in life's competition. These athletic contests should receive the most enthusiastic backing from the medical department of the industry. The doctor's responsibility for the men entering these strenuous exercises should always be kept in the foreground. No man should be allowed to enter a contest on the athletic field without undergoing a thorough physical examination.

One large industry, with which the writer was connected, has as complete an athletic field as any university in the land. This consists of a quarter mile cinder track, baseball diamonds, fourteen tennis courts, and all the paraphernalia for a complete field day, as hurdles, jumping and pole vaulting standards, etc.

Every year a field day meet is held with at least 300 entries. The preliminaries may be held the week preceding the meet. The attendance at these meets is from 12,000 to 15,000 people.

Besides the track teams, this concern has twelve regular ball teams, and innumerable pick up teams for ball games at the noon hour or in the evening. Hundreds of employees take advantage of the tennis courts. All of these athletes are thoroughly examined by the medical staff before being allowed to participate in the training for these contests or to join a team. Many a man with an unknown heart lesion, a beginning lung condition, a hernia, or some other early defect is discovered in this way. For these the strenuous athletic sports would have been detrimental and in many cases absolutely dangerous.

Therefore, while physical exercise may be a great boon to the employees and may be a favorite prescription for the doctor to give, yet it should never be prescribed without previously examining your patient and selecting the proper type of exercise and the amount of the dose.

These examinations are thorough from head to foot and always include a urinalysis and other laboratory tests when needed. College athletes are supposed to be examined before entering into similar

contests, but with only four or five exceptions no college or university submits their athletes to an examination that is worthy of the name. On account of this, great damage is done to the physical make-up of many of our college youths.

A wonderful opportunity is given to the industrial physician to introduce healthful exercise and athletic contests among millions of boys and girls and men and women throughout our country. But in doing this they should impress upon the people the importance of examining the machine before undertaking the strenuous work.

Universal military training would be a mighty boon to the health of our young manhood because it would be accompanied with medical examinations and the type and amount of drill would be on a selective physical basis. The stimulating of athletics among employees, if based on a similar plan of physical selection, would be equally beneficial.

A comprehensive human maintenance department therefore must include in the scope of its work these recreational provisions.

CHAPTER XI

FOOD

Food is one of the most significant factors in the maintenance of health. The medical department of an industry that pays no attention to the food of the employees is neglecting an important duty.

The inalienable right to eat whatever one wants cannot be tampered with by any employer. Even the company physician cannot prescribe the proper diet for employees and force them to follow it. But in many subtle ways the physician can influence the diet of a large group of people just as he does for an individual patient.

The responsibility does not cease with the suggestion of proper food to eat but deals more with correlated subjects. Therefore, the physician responsible for the health of hundreds of employees must be on the alert to discover group defects in nourishment and quick to find the cause and remedy for the same.

In dealing with the individual employee he can inquire into the question of diet and suggest corrective changes when needed. He can ascertain whether or not the wages paid are inadequate to properly nourish the employee and those dependent upon him. Often the dependents are so numerous that this becomes a real cause for undernourishment and resulting sickness. He will discover certain conditions which are the result of improper food, improper eating places, irregular meals, hasty consumption, insufficient teeth for proper mastication, peculiarities of diet detrimental to the individual and many other conditions where the food and eating habits have a direct bearing on the physical condition.

These faults are best corrected by frequently repeated advice to the individual. He can even take up the question of low wage with the management, when he feels that this is the cause, and usually have it corrected. Even a wrong diet at home for the employee and his family can be corrected by proper advise from the physician assisted by the subtle, diplomatic suggestions of the visiting nurse who drops in for a friendly call on the wife.

But in dealing with the entire group of employees the industrial physician can do many things, with and without the assistance of the employer, to influence the health of the people under him as related to food and food conditions.

Talks to employees individually and in groups concerning food hygiene will bear certain fruit. Written pamphlets handed out from the office or distributed to the employees through the pay envelope will give further results and are of greater value because they usually are read by the wife or mother at home.

After inquiring into the food eaten by thousands of employees, one is convinced that bread, meat and potatoes are used to excess, and that milk, green vegetables and nourishing soups are neglected by the majority of housewives who are responsible for maintaining the man power of the industries of the country. A campaign of education directed along these lines by the medical staff will result in great benefit to the health of the working force. Too long has the doctor neglected this power at home which could be directed into useful co-operative channels.

Where employees carry their lunches to work two problems present themselves for the attention of the doctor. First, a study of the food will show that the average lunch is far deficient in calories. The writer has investigated hundreds of such lunches and the average contains a cold bread and meat sandwich (the bread is often a cold biscuit), a piece of pie and a banana. This would do occasionally but the same thing day in and day out is not a sufficient lunch for a hard working man. His fuel box is not replenished at the noon hour and his efficiency in the afternoon is bound to suffer. This is not so true in smaller towns where the dinner pail is still in use. But in our cities the dinner pail is out of fashion and the small paper sack which can be stuck in the pocket has replaced it.

The second problem is, Where are these lunches eaten? The majority of girls carrying their lunches will eat them at their desks and then will spend the remainder of the noon hour sewing or reading. Or, they will congregate in some dark corner where the lunches are consumed, sitting there and talking for the rest of the hour. The men will find some secluded spot, eat their lunch, and then curl up for a nap or will sit inside and smoke. The incentive to get out of the building at the noon hour and exercise in the fresh air by walking somewhere for their lunch is removed when it is carried to work and kept in the desk or locker.

To correct these two conditions every industry will find it worth while to provide lunches and proper eating places for their employees.

The plant restaurant is a fixture in many concerns. The food should be excellently prepared and sold so reasonably that it would be chosen in preference to neighboring restaurants or even to carrying the lunch. The majority of concerns do not give sufficient attention to the quality and preparation of the food in their restaurants.

The profit from such a restaurant should not be made from the sale of food but from the more efficient, happy, well nourished working force.

The restaurant should be located outside the plant, forcing all employees to go out at the noon hour. A place should be provided in it for those employees to eat who carry their lunches. Some concerns serve milk and coffee to these in order to get them to the restaurant.

A proper eating place should always be provided and then a rule made and enforced by the management that no employee could remain inside at the noon hour. During this period the department should be aired out thoroughly. In addition to this rule the medical staff should constantly urge the employees to get out of the plant at the noon hour and secure some healthful, invigorating exercise.

If a restaurant is maintained at the plant, it is the duty of the medical staff to keep a close supervision over it. The following measures should be adopted in this respect:

1. Periodical medical examination of all employees in the restaurant. Every employee handling or preparing the food or working in the kitchens should be thoroughly examined every three months to ascertain if any diseased condition exists that could contaminate the food being served to the employees. No one should be allowed to go to work in the restaurant without first being examined.

In one industry, during one year, where this plan was followed, two cases of tuberculosis, two of active syphilis, one of diphtheria and one gonorrheal case were prevented from being employed in the restaurant. In addition a young girl, a foreigner, who was to be employed as a dishwasher was found to be bodily filthy. She had not bathed for seven months according to her own statement. No, she was not rejected, but rather was given a bath by the nurse and was then employed with the understanding that she could hold her job by bathing twice a week. She reported once a week to the nurse who ascertained if she was living up to the contract. The contract, by the way, was made between the doctor, the nurse and the girl and no one else knew of the condition. This girl is now one of the best waitresses.

The ruling out of these diseased conditions undoubtedly prevented the spread of disease among many employees. Such a system should become universal and should be carried on by every city health department in the land as regards the public eating places.

A business man, whom I told of this condition, immediately had his four servants at home examined by his family physician, and one or them, the cook, was discovered to have an active tuberculosis.

2. A sanitary inspection of the kitchen and dining rooms, the store rooms, pantries, and refrigerators should be made frequently by

the medical staff. These inspections if backed up vigorously by the management will do more than anything else to provide clean, sanitary conditions in the restaurant. They are essentially a part of the health supervision of the employees.

The following outline suggests the things which should be inspected.

SANITARY INSPECTION OF A RESTAURANT

1. **General Survey:**
   - (*a*) Is it clean?
   - (*b*) Is it well ventilated?
   - (*c*) Is it well lighted and frequently aired out?
   - (*d*) Is it smelly?
   - (*e*) Is it located near unsanitary surroundings?

II. **The Kitchen:**
   - (*a*) Is it clean?
   - (*b*) Is it screened?
   - (*c*) Are flies present.
   - (*d*) Is the food left unduly exposed?
   - (*e*) Are the tables greasy or covered with remnants of food?
   - (*f*) Are the cracks in tables clean?
   - (*g*) Is the stove clean?
   - (*h*) Are the ovens clean?
   - (*i*) Are cobwebs present?
   - (*j*) Is the plumbing in good condition and drain pipes free?
   - (*k*) Is garbage left about and exposed?
   - (*l*) Is the refrigerator clean, free of spoiled food, sweet smelling, and are the corners free of grease and food particles? Is good drainage from ice-box provided?
   - (*m*) Are the store rooms clean; the shelves well arranged; and no spoiled food about?

III. **The Dining Room:**
   - (*a*) Is it clean?
   - (*b*) Is it screened?
   - (*c*) Are flies present?
   - (*d*) Are the tables clean and free of particles of food?
   - (*e*) Are the dishes clean?
   - (*f*) Are cracks in tables free from food particles?

IV. **Any Other Unsanitary Conditions Present?**

3. The food should be frequently inspected. The milk and ice cream should be bacteriologically examined. Every effort should be made to see that nourishing, well prepared food is served.

In a cafeteria conducted by an industry the lunches ordered were carefully studied. This revealed that among the girls and younger employees especially, the average lunch consisted of ice cream, a dill pickle, a piece of cake and some candy; or some other equally unbalanced diet. The management was prevailed upon to serve only nourishing food. Suggested menus were displayed and every effort made to influence the employees to buy proper food. Some went to outside cafes where the pastries and pickles were served but the majority fell into line.

Fig. 20.—A model cafeteria for employees.

Where restaurants in the neighborhood of the plant are patronized the plant physician can take it upon himself to make an unofficial inspection of these places. If unsanitary conditions are found or questionable food is being served, he can report the place to the municipal health authorities.

Close co-operation should be developed between the medical department and the city health department as frequently you are forced to appeal to them on many accounts.

The Cincinnati Milling Machine Company under the direction of Dr. Otto Geier has recently developed a most efficient system for feeding their employees. Through the courtesy of Dr. Geier I am permitted to publish pictures of this restaurant and of the floor plan.

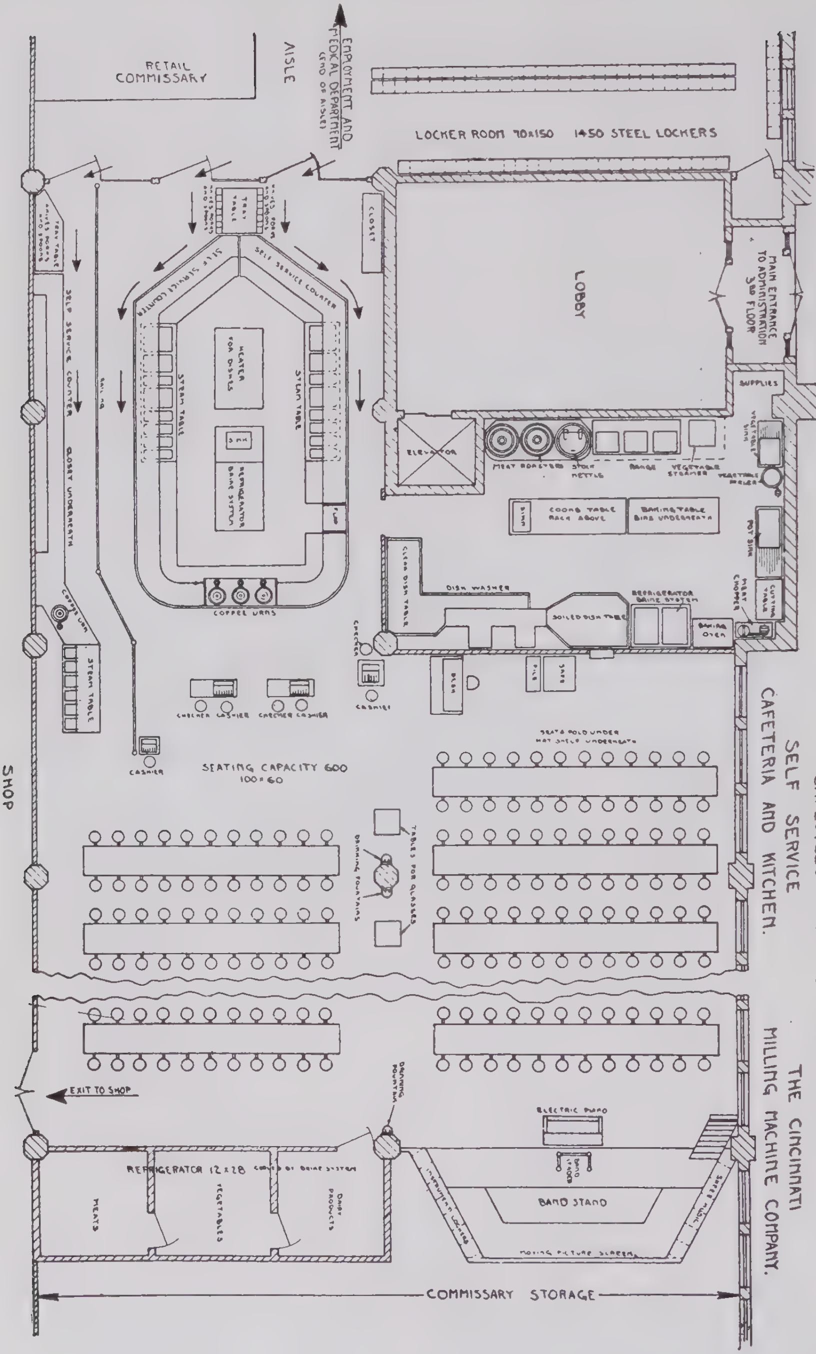

Fig. 21.

EMPLOYEES' SERVICE DEPARTMENT.
SELF SERVICE CAFETERIA AND KITCHEN.
THE CINCINNATI MILLING MACHINE COMPANY.

No national health program will ever be complete that does not include careful supervision of foodstuffs, the places where they are prepared and served, the people handling them, combined with an educational campaign as to the proper foods which should be eaten. The physician in industry has it within his power to initiate this feature of a health program for a limited number of people at least.

Fig. 21.—Dining room, floor plan, showing Cafeteria and its relation to commissary and locker room. (Cincinnati Milling Machine Co., Cincinnati, Ohio.) (*From "Employees Service News."*)

The dining room has a seating capacity of six hundred. The flow of the employees through the locker room into the dining room at the noon hour is indicated by the arrows. The three self service counters with cashiers at the cash registers, with their corresponding checkers, permit of a very rapid movement into the dining hall. But ten minutes is consumed in passing six hundred into the dining room. The convenient position of the kitchen reduces labor cost. The shop band plays in the dining room during the lunch period. The space under the band stand provides a place for the refrigerating machinery which is connected up with the refrigerators in the kitchen and within the self service counters space.

The self service plan makes it possible for the employees to have their choice of two or three kinds of meats, as many vegetables, salads and pastries as will suit both their appetites and their purses. It affords hot, well cooked, clean foods at a minimum cost, and thus should add much to the physical well-being of the shop force. The average check, in spite of the high cost of food, is twenty cents.

CHAPTER XII

RECORDS

In any industry sufficiently modern to recognize the value of a medical service, practical, business-like methods prevail—the same must be applied to the medical department. It has been pointed out in previous chapters that the frequent, periodical medical examination of each employee would be more ideal, but such a plan is not feasible. More practical methods of meeting the situation had to be formed. Again it might be more efficacious if the doctor spent more time in the routine medical examination of applicants but such would interfere with the real business of the industry, which after all is not the running of a young hospital.

Rapid, efficient methods are demanded in all departments and the successful industrial surgeon has met these demands. At the same time the high standards of professional work have been maintained.

Records setting forth the history of the patient, the diagnosis, the character of the treatment given and other necessary data are now recognized as indispensable to the really scientific physician. The history sheets and records usually employed, however, are entirely too voluminous for industrial practices. Therefore the records of the various medical departments in industries have been boiled down until we now have several very efficient systems of record keeping. Practically all such records show only positive statements or findings. Thus if the history is negative the space for history is left blank. If venereal diseases are denied nothing is mentioned about them. On the other hand it is much wiser to record either positive or negative findings wherever the question of compensation may be involved. For example an applicant is found to have no hernia at his examination for employment. The record should show "no hernia."

In the following pages I have presented examples of record cards used in my industrial clinic which have been adopted after several years of experience. While this may not represent the best system yet it shows the number of different records it is necessary to keep and the manner of combining them into one record.

FILING

Formerly separate cards were kept for medical, surgical, social and dental cases. Now all of these are combined in one record called Doctor's Office Record. This record is kept in a folder and filed according to the cross-index system (according to name and number).

In order to quickly discern the medical, surgical or dental record on a case, the surgical record and all pertaining to it, namely, nurse's calls, laboratory or x-ray reports are typed in red; the medical record in black and the dental in purple.

INFORMATION RECORD

Hosp. No.__________

Serial No.__________

Name____________________ Married } Single }__________

Date of Birth__________Nationality__________In U S.__________Citizen__________

Date	Address	Dept.	Telephone	Occupation

Date Emp. or Rein.	Date Resigned	Cause

Physical Examination
(History of Diseases, Accidents or Operations.)

Personal

Family

Exam. for Emp. (Date)	Temp.	Pulse	Height	Weight

Eye Test	Urinalysis: Albumin	Sugar	Micro.
R	Result of Exam.		
L			
Both			

Doctor's Recommendations

Exam. Phys.

Re-examinations

Fig. 22.—Information record for applicants for work. This is made out in duplicate by the employment department and is sent with the applicant when he comes to the doctor's office for physical examination. The nurse takes the medical personal history of applicant, also temperature, pulse, weight, height, eye test and urinalysis. The applicant is then sent in to the doctor, who examines him. If physical defects are found which might interfere with his work at present, applicant is asked to report for re-examination. After being examined, he takes both original and duplicate to employment department. If he is employed, the employment department notes the department to which he is assigned, also serial number and returns original copy with this information to doctor's office. In case of handicapped persons who are employed their job is selected after a conference between the employment manager and the doctor.

DOCTOR'S OFFICE PASS № 18351 Date________

Name________________________ Dept.________

Address______________________ Serial Number ________

O. K.________________

Make Out in Duplicate and Send Both Copies to Doctor's Office.

3'5763

Fig. 23.—Doctor's office pass. This pass is issued in duplicate to the employee who wishes to go or is called to report at the doctor's office. He gives it to the record clerk at the door, she numbers and stamps time in on it, then gives the original to the file clerk to look up employee's record. When employee is ready to leave the department, the doctor or nurse who last cared for him, returns pass and he again presents it to the record clerk at the door. She looks up duplicate, stamps both with time out and gives duplicate to the employee to give to his manager and retains the original at this office.

Date Employed 10/16/1916. **DOCTOR'S OFFICE RECORD**

S. M. B. A. ________

Name Casey, John. Dept. 187 Hosp. No. XXXX.

	DATE	TEMP.	PULSE	WGT.	REMARKS AND SIGNATURE OF PHYSICIAN OR NURSE	HOME PASS OR FIRST DAY ABSENT	DATE OF RETURN	TIME LOST
	11/3/16	98.6	72	132	Indigestion. Seidlitz. Dept. C.M.K.			
	11/18/16				Abraded left thumb on broken china. Piece of china removed. D.D. To report in A.M. DR. PARMELEE.			
	11/19/16				D.D. Disch.			
	12/20/16	100	88		Headache. Aches all over. Influenza. DR. ELLIS.	10.30		
	12/22/16	99.6			Reporting. In no condition to return to work. Home again. DR. ELLIS			
	12/27/16				Nurse's call A.V.C. Absent since 12/20/16. Reported 12/22/16, but was given pass home again. Has grippe. Has had no doctor, but is using home remedies. Is up and around, but very weak and rundown. Temp. 98.2 Return indefinite.			
	1/12/17	99.6			Influenza. Examination negative.	12/22/16 2 P.M.	8A.M.	17 da
Dent.	1-30-17				All teeth pyorrheic. Referred to family D.D.S. advising cleaning and 1 filling. Recall 2-28-17. DR. MONTGOMERY.			
Dent.	2-28-17				Reporting. Proper prophylaxis administered by family D.D.S. Susceptibility to focal infection neglegible. DR. MONTGOMERY.			
	3/22/17				Resigned.			
	2/10/18				Reinstated.			
	4/29/18				8.30 A.M. While at work on 4/27/18 packing hardware, patient punctured right index finger tip on sharp object in order. Paid no attention to it and did not use iodine. No witness. 4/28/18 while at home finger became very painful. Reported here 4/29/18 8.30 A.M. Finger swollen and painful. Temp. 100.4. Seen by Dr. Fox and put in rest room with hot dressings to hand. Advised because of lymphangitis. At 1 P.M. temperature 100.6. Sent to Washington Blvd. Hospital for continuous hot dressings.			
	5/3/18				Reporting. Left hospital this A.M.			
	5/6/18				Returned to work. DR. FOX.			

FIG. 24.—Doctor's office record. This is made out either the first time the employee comes to the doctor's office for examination or treatment or when a nurse's call is made at an employee's home. All subsequent information and treatment of whatever nature is kept on this record. The medical record is written in black; the accident record in red and the dental record in purple thus facilitating the reading of the record.

EMPLOYE'S GENERAL PASS

This pass to be used going from one department to another, one building to another, or when leaving plant for any purpose whatsoever.

Date ____________________

To Usher:

Pass ____

From Dept. ____________________ to ____________________

____

Time Going ____________________ Returned ____________________

Reason ____

On the above lines designate the department and building to which the employe is sent. If the employe is leaving the premises, state if for personal reason or on house business.

This pass will serve as an identification card and when going out of or into different buildings must be shown to the usher as authority for exit or entrance. Pass to be returned to the person O. K.'ing same, except where employe leaves the premises not to return for the day, in which case it will be taken up by the usher.

____________________ Mgr.

Asst. Mgr. Office Mgr. Timekeeper.

If not signed by the department manager, the assistant signing will check his official title as noted above.

Fig. 25.—Employee's pass home. This is issued by the doctor's office when an employee is sent home on account of illness.

EMPLOYES' RETURN TO WORK PASS

Date employed ____________ Date ____________

Member of S. M. B. A. ____________

Name ____________________ Dept. ____________

Returned to work today. Absent ____________ days on

account of ____________________ Should report to

Doctor's office ____________________

Signed ____________________

F412

Fig. 26.—Return to work pass. This is issued by the doctor's office when employee is able to return to work after absence on account of illness.

REPORT OF ACCIDENT No.______

INSTRUCTIONS:—Accidents, However Slight, Must Be Reported In Full

Date______________191__

ALL OF THESE 16 QUESTIONS WILL BE FILLED OUT IN THE DOCTOR'S OFFICE

1. Name______________ 2. Address______________
3. Department__________ 4 Age____Years____Mos. 5. Occupation______________
6. Nature and Extent of Injury______________
7. Description of Accident by Injured Person (Give full details)______________
8. Statement of Witness or Other Person Familiar with Accident______________
9. Name and Location of Machine, Appliance or Thing Causing Accident______________
10. Where Taken After Accident?______________
11. Name of Attending Physician______________
12. Probable Length of Disability______________
13. Date of Accident________Hour________ 14. Date Reported to Doctor's Office________Hour________
15. Remarks______________
16. If sent outside of Doctor's Office for treatment, state where sent, why, and when sent (date and hour)

In case of operation or treatment of any kind, outside of Doctor's Office, full details must be given in space provided on Final Accident Report.

Signed______________

F3631 (OVER)

Fig. 27.—Report of accident. This record is made out in quadruplicate on all accident cases where time is lost. One copy is retained in employee's record, one is sent to the safety engineer, one is sent to the manager and the other is sent to the payroll department.

QUESTIONS 17 TO 32 TO BE FILLED OUT IN THE DEPARTMENT

17. Length of Service of the Employe________________

18. Has He a Wife or Children?________________

19. How Long Engaged on This Work?________________

20. Was Injured Person Familiar or Not With the Work Engaged in, or With the Machinery Operated at the Time of the Accident?________________

21. Instructed as to Its Hazards?________________

22. Has He Done Similar Work Prior to This Employment?________________

23. Was Accident Due to Want of Care on the Part of Injured Person?________________

24. Was Accident Due to Negligence on the Part of Any Person?________________

25. If So, How?________________

26. Who Was in Charge of the Work Where Accident Occurred?________________

27. Give Names and Addresses of Witnesses________________

28. Is Injured Person a Member of the S M B. A.?________________

29. Should S., R & Co Pay Salary During Disability?________________

30. Serial No.________________ 31. Time Card No.________________

32. Remarks________________

Signed________________

Date________________191___ Manager Dept.________________

A. E. & C. CHECKS ISSUED FOR TIME LOST

Check Issued	For Week Ending	Days Paid For	Amount	Check Issued	For Week Ending	Days Paid For	Amount	Check Issued	For Week Ending	Days Paid For	Amount

F2681 (OVER)

FIG. 28.—Back of accident report to be filled out in the department.

FINAL ACCIDENT REPORT.

SUPPLEMENTARY TO ORIGINAL REPORT. Date ____________

1. Name ____________ 2. Address ____________
3. Department ________ Emp. No. ________ 4. Occupation ____________
5. Nature of Injury ____________

6. Date of Accident ____________
7. Date of Returning to Work ____________
8. Partial or Complete Recovery ____________

9. Amount of Disability (time). From ____________ to ____________ both inclusive.
10. Name of Attending Physician ____________
11. Remarks ____________

12. If taken to an outside hospital, fill out the following:

Name of Hospital ____________

Date ____________ Hour ____________

Nature of Treatment or Operation ____________

Attending Physician or Surgeon ____________

Length of Time in Hospital ____________

13. If given treatment outside of Doctor's Office or outside hospital, fill out the following:

Where Treated ____________

Nature of Treatment ____________

Date ____________ Hour ____________

Name of Physician ____________

Signed ____________

F-782

Fig. 29.—Final accident report. This report is made out in quadruplicate on all accident cases where time is lost, when an employee returns to work. One copy is retained in employee's record, one sent to the safety engineer, one sent to the manager and the other is sent to the payroll department.

REPORT OF NURSE'S CALL

Date__________

Requested by__________

Name__________ Dept. __________

Address __________ S. M. B. A.__________

Length of Service__________ 1st Day Absent__________

T.__________ P.__________ R.__________

Dr.__________ Address__________

Instructive __________

Return__________ Nursing__________

Remarks __________

F4919 To be made out in TRIPLICATE.

Fig. 30.—Request for nurse's call. This is made out in triplicate by departments and sent to the doctor's office when requesting a nurse's call. One copy is retained in the doctor's office, one is sent to the department and the third is sent to the welfare department. The one retained by the doctor's office is filed according to date and kept for one month or until the monthly report is made out. If the doctors or nurses wish call or revisit made on an employee, they also fill out one of these blanks, dating it for the day they wish call to be made. It is then put in file for that day and is automatically handled at that time.

CHAPTER XIII

INDUSTRIAL HEALTH SERVICE

A RÉSUMÉ OF ITS GROWTH

Hygiene, which is the science of health preservation, and deals with all the laws of sanitation, has developed a specific significance when applied to Industry. It includes plant sanitation, prevention of occupational diseases and most of the measures adopted for the supervision of the health of employees.

From the employer's standpoint *industrial hygiene* is now recognized as the cornerstone of *maximum production.* From the standpoint of the medical man it is the cornerstone of *preventive medicine.*

Industrial Hygiene, however, does not include the entire field of Industrial Medicine and Surgery—a mistake which apparently has been made by some workers in this field. The all-round Industrial Surgeon must have a clear understanding of these laws of industrial sanitation but he must also be a competent diagnostician and capable of treating disease and injuries.

This form of public health service was rarely mentioned prior to fifteen years ago, but to-day it is receiving the attention of engineers, physicians and employers in general. Medical schools and engineering schools are teaching their students various phases of Industrial Hygiene. State Legislatures are enacting new laws to better the sanitary conditions of workmen. In fact, few subjects have received such widespread attention or have reacted for greater good to the nation in so short a time.

In 1911 the author published the following statements in a booklet on Medical Work and Sanitation in Industry:

"Industrial sanitation is practically a new subject. While it is years behind other forms of sanitation, such as the work of our municipal and state boards of health, the improvement of conditions in state prisons and asylums, and the United States Government methods for the preservation of health among our soldiers and sailors, yet, in this country, during the last decade, some notable advances have been made tending to vastly improve the conditions of the working men and women. Chief among these has been the creation of departments of Industry and Labor in many states of the Union. Through the work of these departments child labor has diminished, shorter hours (especially for women and children) have been obtained, women are

allowed to sit while at work and are surrounded by healthier and less demoralizing conditions, overcrowding of workshops has been greatly reduced, and employees are more and more protected from dangerous machinery and injurious gases and dusts. But, the advancement thus far along these lines is only a very small beginning, and a careful study of our various state labor laws reveals the fact that until these are made more stringent, very little can be accomplished for the betterment of health in our industries.

"The report of the Department of Commerce and Labor for 1909 and the various state labor laws show that only twenty-one states have a section bearing directly upon the subject of factory and workshop sanitation. Alabama, Illinois, Massachusetts, Minnesota, Ohio, Oregon, Tennessee and West Virginia state that all workshops must have 'proper ventilation and proper sanitary conditions,' but none of these makes specific recommendations as to what constitutes 'proper.' The standard for these conditions is evidently left to the judgment of the State Factory Inspector—which is not always a good plan. The laws of Indiana, Maryland, New Jersey, New York, Pennsylvania and Wisconsin are somewhat better, because these states require that every employee within an enclosure must have a certain amount of air space, varying from 250 to 400 cubic feet per person. These states are also slightly more specific in their requirements for proper sanitary conditions. Illinois and New York have stronger laws than the few other states that mention it, dealing with the restriction of the sale of articles manufactured by diseased employees or made in unhealthy surroundings. Practically all of these states require that fans, blowers and suction pipes shall be installed in workshops where injurious gases or dust exist, to facilitate the removal of the same. Missouri and New Jersey require the painting or whitewashing of the interior of all workshops at least once a year. Missouri has a law against overcrowding of factories, which can be enforced if a certificate is obtained from any reputable physician that said factory is crowded to the extent that it is unhealthful.

"Massachusetts alone requires the placing of cuspidors in all buildings where people are employed. But neither Massachusetts nor any other state legally stipulates how these cuspidors shall be cleaned or handled. It is, indeed, paradoxical that we have laws prohibiting spitting anywhere but in cuspidors, and yet there are no laws designating how the contents of the same shall be disposed of. In most cases disposal is left to the whims of the porter in charge. The fact that the death rate from consumption is higher among porters than among any other class of workers points to the highly infectious nature of the contents of these cuspidors. Not alone the porters, but the whole community is exposed by the careless handling of these germ incu-

bators where the flies delight to feed. There is no state law in the country prohibiting consumptives from working in intimate contact with other employées, and only a few states specify that consumptives shall not be employed in bakeries or other places where food products are prepared. Even these do not provide for regular inspection of such employees by a physician in order to rule out the tuberculous.

"This short résumé of the various state labor laws in their relation to sanitation will certainly impress the layman, who is especially interested, as well as any medical man, with their great lack of preventive legislation, which, if enacted and enforced, would greatly reduce the death rate among the wage earners, and at the same time improve the hygienic and economic conditions of every community."

Since the above was published almost every state in the Union has enacted laws seeking to improve the working conditions of employees. Thirty-seven of our states now have laws on Employees Compensation. Recently some of these states have included occupational diseases under the causes for compensation. To-day at least four of the states are considering laws for sickness insurance for workmen.

All of these laws, enacted for the benefit of employees, have improved industrial health conditions to a great extent. Yet, we can repeat our statement made in 1911, that a résumé of the laws must impress one with the lack of preventive legislation, which if enacted and enforced, would greatly reduce the death rate among wage earners.

If the legislative advancement along these lines has been rather slow, the voluntary advancement of industrial hygiene by many of our large concerns, by national organizations and by a few state departments of Industry and Labor has been very rapid.

Prior to 1909 a few state factory inspectors and a few other individuals had called the nation's attention to the wastage of human life by some of the more flagrant unsanitary conditions in industry. About this date there seemed to be a great incentive given to the subject by the writings of a number of physicians connected with industrial concerns.

The studies of Dr. Thomas Crowder on ventilation, of Dr. Alice Hamilton on lead poisoning, of Dr. J. W. Schereschewsky, and of Dr. George Price on health conditions among garment workers, and of men like Dr. E. R. Hayhurst and Dr. Francis Patterson working in connection with the departments of Industry and Labor of the states of Ohio and Pennsylvania respectively, stand out as milestones in the advancement of Industrial Health in this country.

Extending inspection to the employees themselves, by physical examinations, as well as the inspections of their working places, was one of the greatest advances ever made in health supervision in this country. In 1906 Dr. Frank Fulton, in Providence, R. I., examined a number of

employees free of charge for the purpose of discovering tuberculous workers. This is one of the first examples recorded of a careful effort at supervision of the health of workmen. In 1909 Mock started the examination of employees in the concern of Sears, Roebuck & Company, of Chicago, for the purpose of discovering the tuberculous. It soon became evident that such a procedure revealed many other diseases, which, taken in their incipiency, could be checked. This fact, because of its economic basis, became one of the strongest arguments in favor of the physical examination of employees. Similar reports setting forth the benefits of this practice were made during the next few years by Dr. Irving Clark of the Norton Grinding Company, Worcester, Massachusetts, by Dr. Otto Geier of the Cincinnati Milling Machine Company, by Dr. Wilbur Post, of the Peoples Gas Co., Chicago, by Dr. C. G. Farnum of the Avery Company, Peoria, Illinois, by Dr. S. M. McCurdy, of the Youngstown Sheet and Tube Company, by W.G. Hudson, of the Du Pont Company, and other workers in this field. By 1914 physical examinations of employees was a fixture in many industries.

The Committee on Factories of the Chicago Tuberculosis Institute, composed of Drs. James Britton, Theodore Sachs and Henry Faville, was instrumental in extending this system to a number of the other industries of Chicago. Their report on this work, presented before the National Tuberculosis Association in 1914, gave a marked impetus to this branch of Industrial Hygiene throughout the country. Since then the National Tuberculosis Association has been a stanch advocate of this form of medical work.

With the formation of the National Safety Council such physicians as Geier, Patterson, A. M. Harvey, Farnum, Irving Clark, Mock, McCurdy, C. A. Lauffer, L. A. Shoudy and others, pointed out the need of improving the hygienic conditions of the workmen as a definite part of any accident prevention program. As a result, this great organization formed its Health Service Section in 1914, which has been instrumental in improving sanitation in so many of our large industrial concerns.

In the American Public Health Association Drs. W. A. Evans, E. T. Fisk, Alice Hamilton and others were among the first to recognize the influence of this form of public health work, and with some 50 other physicians formed the Section of Industrial Hygiene in that organization during the fall of 1914.

For years the American Medical Association had frowned on the contract practices and other types of work of the company surgeon. The standard of this work in many instances had been far below par. But public recognition of this new specialty of industrial medicine was given in 1915 by this association. In the annual meeting of that year

the Preventive Medical Section of the American Medical Association, Dr. Otto Geier, Chairman, had a symposium on industrial Hygiene. Since then industrial medicine and surgery has had a place on every annual program of that section. In addition, this year the Orthopedic section of the American Medical Association had a symposium on industrial surgery. The recognition of this work by the leading members of our profession testifies to the higher professional standard which it has attained.

In the East, a number of physicians in 1914 formed the Conference Board of Industrial Physicians, under the secretaryship of Magnus Alexander. Many of the leaders in industrial medicine and surgery are numbered among its members. Some of the greatest contributions to industrial hygiene have been made by this group. In the West, such men as Dr. R. W. Corwin, of Colorado, Drs. Tucker, Philip King Brown and Robert T. Legge, of California, Dr. J. R. Yocom, of Washington, and others, have been responsible for improving conditions in the mining and lumbering industries.

Recognizing that the public health of the nation was being influenced to a very marked degree by these various efforts of local and national organizations, the U. S. Public Health Service formed its division of industrial sanitation. With such men as Schereschewsky, C. F. Rucker, B. S. Warren and A. J. Lanza in the Public Health Service, and such consultants as David Edsall, Price, Gilman Thompson, A. S. Stengel, C. D. Selby, and others, great progress has been made during the last five years in improving health conditions among employees engaged in certain industrial lines where the health hazards have been excessive.

Likewise, the U. S. Department of Labor has rendered most valuable service to the country through the work of Drs. Alice Hamilton, Royal Meeker, L. P. Cheney, and others. These workers and their assistants have made exhaustive studies along various lines of industrial sanitation. Their work on occupational diseases, accident hazards, fatigue, ventilation, lighting and numerous other subjects, has formed a basis for correcting faulty conditions in many kinds of industry.

The Bureau of Mines has been engaged in a similar service in the mining industries of the country. These efforts of the National Government to improve the hygienic conditions of the employees of the nation's industries are most praiseworthy. They mark the beginning of what must finally come to pass—a centralized supervision of health conditions throughout the country, not only among industrial employees but in all walks of life.

It is to be deplored that several Federal departments are engaged in this work, as at present. The desire to justify appropriations, to secure credit for doing a piece of work, and certain interdepartmental

jealousies which prevent proper co-operation between departments, all tend to duplication of effort and retardation of results.

There is no doubt that certain angles of this work has to do directly with the question of labor. But the chief problems of industrial hygiene are primarily health problems and should be centralized under that federal agency which is responsible for the public health of the nation.

In 1916, recognizing the great need of uniting to secure the greatest advancement in these health problems in industry, the physicians and surgeons of the country, engaged in industrial medicine and surgery, organized the American Association of Industrial Physicians and Surgeons. The men, who during the preceding eight or ten years, had been striving alone or in subsections of other organizations, now met for the first time as a united group with a common purpose. The combined efforts of this association has undoubtedly done more to raise the standards of the physician engaged in industrial practice, and to increase the benefits from this work to both employees and employers, than any other one agency which has entered this field.

During the last five years medical schools have recognized the great opportunity for service offered to physicians in the field of industrial medicine and surgery. Doctor Legge, at the University of California, started a course on Industrial Hygiene which has become very popular with all the students. Hayhurst instituted a similar course in the University of Ohio. Stengel at the University of Pennsylvania, and Thompson at Cornell, introduced the subject of occupational diseases in the curriculum of those schools. Harvard, co-operating with the Massachusetts General Hospital, has held clinics on occupational diseases for several years. Mock at Rush Medical College, some three years ago, started a night clinic on industrial medicine and surgery. It has had the strong support of such men as Billings, Herrick, Dodson, Ellis and others, and is now recognized as one of the great sociologic movements of Chicago. This course affords the students a very broad training in every phase of work encountered by the physician in industrial practice. No one effort put forth by medical schools will yield so great a return in benefits to the nation's health as these courses on industrial medicine.

A great many other men, both physicians and laymen, have had an important part in developing this great public health movement. Through their efforts industrial medicine and hygiene have become most potent factors in the Industrial life of our nation. Never again will we return to those dark ages when the human machine was driven to the limit without lubrication or repair and simply "scrapped" when disease, often the direct result of the occupation, robbed it of further usefulness.

The physicians and other workers in industrial hygiene cannot claim all the credit for the developments that have taken place in this field. Some of our large corporations, without the help or advice of medical men, have voluntarily started improvements in the working conditions of their employees. The work of the National Cash Register Company, at Dayton, Ohio, will always stand out in the industrial history of our country as one of the pioneer efforts to improve conditions for the comfort and welfare of the employees. There may be many criticisms of the system adopted by that concern, but nevertheless its example and influence was a great stimulus to other employers to take a more humane attitude toward their people.

In more recent years the Ford Motor Company has adopted a broad economic and sociologic policy toward their employees which has for its very foundation most of the principles of industrial hygiene. They have found it necessary to form the closest co-operation between their sociologic department and their medical department. In fact, in very few concerns is the medico-sociologic aspects of this work in industry more clearly demonstrated.

The housing experiments of the United States Steel Corporation are well known, and mark a decided advance in industrial hygiene. Many other concerns in this country have recognized the relationship between improved home conditions, better health and increased production.

As a result of these combined efforts of individuals, organizations, and certain employers on the one hand, and of the various state and federal agencies on the other, we are able to point to approximately 8,000,000 of the workers of the nation who are receiving the benefits of this enlightened era in industry to a more or less degree. There still remain about 30,000,000 of our people who are responsible for production of some type in this country who are not receiving any kind of health supervision. Many of these are working under intolerable conditions. The amount of child labor still in use is unbelievable. The lack of protection against the commonest forms of occupational diseases is appalling.

Even in many of those concerns where maximum production is so essential at this time for the winning of the War we find inadequate housing conditions, unsanitary factory conditions, prevalence of occupational diseases, and a high accident rate due to speeding up and "green hands." The labor turn-over in some of these concerns is over 500 per cent. To counteract this labor turn-over higher and still higher wages are being paid—often defeating their purpose by increasing turn-over. Even patriotism cannot overcome the bad influence on the working man of such intolerable conditions.

The adoption of the sane principles of industrial hygiene by these

concerns is already taking place. The shipbuilding yards, under the direction of Major Philip Doane, M. C. U. S. A. and later under the direction of the U. S. Public Health Service, are completing a comprehensive system in every yard. The housing bureau is beginning to improve the living conditions of these men. The United States Public Health Service, the National Research Bureau and the Committee on Hazardous Occupations of the Department of Labor are all working to improve the protection afforded to munition workers, and others in war industries, against occupational diseases.

Thus, under the stimulus of war, industrial medicine is making its greatest advances. Decreased sickness, decreased accident rate, decreased labor turn-over have already resulted in increased production.

Production everywhere is the most vital need of the day. On it depends the victory or defeat of our armies. Those concerns which continue to waste their man power with a resulting diminution of output should be commandeered.

Conservation of man power with maximum production is the battle cry of the country. The adoption of Industrial Health Services by every industry is the answer.

PART II

PREVENTION

CHAPTER XIV

PREVENTIVE MEDICINE AND PREVENTIVE SURGERY IN INDUSTRIES

Industrial medicine and surgery consists of applying the general principles of medicine and surgery to a large group of people as a unit. While individuals receive special medical or surgical care whenever needed, yet it is apparent in every chapter of this book that prevention is the keynote of all this work; *prevention of diseases* or *accidents* among the *entire group* of *employees; prevention* of undue *loss of time* when injury or disease assails an employee; *prevention* of *deformities* and *permanent disabilities*, the result of diseases or accidents; *prevention* of *inefficiency* on the job when traceable to some physical condition; in fact, the *prevention* of everything which would tend to undermine the physical or mental welfare of the individual or of the entire group of employees.

In order to accomplish this many of our largest industries have developed large staffs of capable physicians and surgeons who spend half or all of their time at the plant. Here by being *on the job—in the front line trench of industry*—they are not only in the strategic position to study and apply every phase of *prevention*, but also to practise the best form of prevention, namely, *immediate* and *proper medical* and *surgical care* for every sick or injured employee.

It is quite evident therefore that industrial medicine and surgery must include many activities aside from the specific treatment of disease.

As the various chapters deal with some phase of prevention we will endeavor here to give only an outline of the preventive work with which the industrial surgeon must familiarize himself in order to become proficient.

Thinking of the work therefore in terms of prevention we must consider first, the employees; second, the physical conditions of the plant; third, the activities of the concern.

I. PREVENTION AMONG THE EMPLOYEES

A. The applicants for work:

1. Complete physical examination of:
   - (*a*) To protect the old force from men capable of spreading disease among them.
   - (*b*) To prevent the diseased applicants from going to work when work of any kind would be injurious to them.
   - (*c*) To prevent applicants with physical handicaps from being placed at hazardous work for them, or at jobs where they could not be efficient.
2. Acquainting the applicants with all forms of disease and accident prevention measures in operation in the plant immediately upon employment.
   - (*a*) This prevents disaster because of ignorance.
   - (*b*) They at once become co-operative units with the existing system.

B. The old employees:

1. Complete physical examination of, either periodically or whenever some condition arises showing the need of a general survey.
   - (*a*) To discover threatened disease early, while still preventable or curable.
   - (*b*) To discover any existing condition that makes the employee prone to accident or to cause accident to others. It is just as important to survey the human machine to prevent accidents as it is to survey the mechanical appliances of the plant.
   - (*c*) To rule out those with contagious conditions to prevent spread of disease.
   - (*d*) To discover those with handicapped conditions, either physical or mental, and to place them at types of work which will not be hazardous for them and where they can still be efficient in spite of the handicap.
   - (*e*) Examination should precede the treatment of any condition, no matter how minor, thus preventing the administering of the wrong type of treatment through lack of knowledge of the true condition or coincident disorders.
2. Secure the co-operation and interest of employees in your efforts for prevention of disease and accidents by:
   - (*a*) Explaining the reasons for any action taken, to each individual.
   - (*b*) Secure team work by employees' committees on "accident prevention," "disease prevention," "sanitation move-

ments." Add new members to the committees frequently and meet with them often. Make them working committees.

(c) Spread prevention propaganda on every phase of the subject throughout the working force by personal conferences with individuals, by lectures and motion picture shows, by use of bulletin boards, by terse facts printed on backs of pay envelopes, by circulars inserted in pay envelopes, by a plant paper or bulletin issued weekly.

(d) Get the officials of the concern interested and use their influence to put across the ideas.

FIG. 31.—This toilet caused 17 cases of typhoid, two of them fatal. Loss in wages and care of the 17 men amounted to $3000.00. (*Typhoid Bulletin, issued by Industrial Surgeons' Association of Washington.*)

(e) Assist the diseased employees at all times in securing the best forms of treatment, thus demonstrating your friendly interest in them. These become "medical missionaries" throughout the working force.

3. Study the relationship between employee and his work:

(a) Study this relationsip in every case coming before you to ascertain if "a round peg is fitted in a round hole," or if the work is incompatible to the employee's mental or physical well-being. This will not only prevent a physical or nervous breakdown often but will prevent inefficiency in production—an inefficiency preventable by transferring the man to work for which he is better qualified.

(*b*) Fatigue poisoning from overwork, from monotony of the same and rapidly repeated motions and other causes, will be discovered and can be prevented.

(*c*) Occupational diseases, and latent possibilities for such diseases in occupations heretofore unsuspected, will thus be found, and steps taken to prevent them.

(*d*) Suggestions for the prevention of accidents will follow a study of this relationship of man to his work.

4. Study the relationship between employee and fellow employees:

(*a*) Incompatibility between an employee and his foreman or some fellow employee may be the cause of a nervous or physical breakdown. The doctor, if he secures the con-

Fig. 32.—"Same toilet as in Figure 31 rendered safe and fly-proof at cost of less than $5.00—after the epidemic. Why not before?" The Industrial Surgeons' Association of Washington has carried on an unceasing warfare against typhoid fever among the lumbermen of the Northwest.

fidences of all employees, may be the first to discover such a condition and by reporting it to the proper authorities can prevent both inefficiency and the threatened breakdown.

(*b*) Among girl employees one given to infrequent bathing with resulting bad odors may be the cause of nervousness and unrest among the other employees—a condition which the doctor is often called upon to correct and which demands diplomacy in handling.

(*c*) A close study of this relationship is necessary to prevent many diseases, many accidents, and much inefficiency.

5. Specific preventive measures rendered employees:

(*a*) Search for focal infections and removal of same—specialists such as dentists, nose and throat men will be needed on the staff for this work.

(b) Recommending vacations, change of work, special treatment and other specific measures to prevent more serious conditions from developing.

(c) Vaccination and specific inoculations against disease, as antityphoid prevention.

(d) Fumigation of working rooms after an employee is found with some contagious disease.

(e) Recommending proper and immediate treatment for all conditions found and supervising the employee to see that same is carried out.

6. Employees' home conditions:

(a) Unsanitary home conditions, home worries, sickness in the family, and many other conditions may be the cause of an employee's physical or mental breakdown. The doctor must subtly study these conditions and suggest needed remedies as a part of his prevention program. Assistance must often be obtained from the employer to correct many of them.

(b) The employees must be taught to report contagious diseases in their family in order that the doctor can safeguard the fellow employees.

(c) Friendly interest in and constructive help to the members of an employee's family always react favorably on the health and productivity of an employee, and therefore is a definite part of the prevention program.

II. PREVENTION AS RELATED TO THE PHYSICAL CONDITIONS OF THE PLANT

A. Industrial Hygiene:

1. This deals with the hygienic and sanitary conditions of the working place. These must be brought to the highest standards in order to prevent disease among the employees as a result of working conditions. This involves a study of the sanitary arrangements of the following and correction when necessary:

(a) The construction of the building.

(b) Arrangements for lighting and ventilation.

(c) Cleaning of the interior of the buildings.

(d) Washing and toilet facilities.

(e) Removal of fumes and dust.

(f) Removal of refuse that would tend to breed flies, mosquitoes, and other disease agencies.

(*g*) Drainage, and sewage disposal.

(*h*) Proper protection of employees from fumes, or direct contact with material that is detrimental to health, and all other forms of protection from occupational diseases.

B. Accident Prevention:

1. Changes in construction of building so that dangerous stairways, unprotected elevator shafts or light shafts, unprotected platforms or other elevations, narrow halls, sharp corners, doors opening the wrong way, or similar conditions, will not tend to cause accidents.

Fig. 33.—Shell filling factory in England. Cleanliness, good ventilation, proper lighting, concrete floors, and respirators aid in production by preventing disease.

2. Repair of all broken boards in floor, broken window panes, loose parts in walls or ceiling, or other dangerous conditions about the building
3. Removal of loose nails, boards, broken glass, broken parts of machinery, tools and all obstacles so placed as to cause accidents.
4. Careful arrangement of stock, boxes, cases, etc., so that they will not fall and cause injury.
5. Repair of all tools, machinery, and appliances used in work so that accidents will not occur to the user of the parts or to fellow employees.
6. Safeguarding all machinery and other physical appliances

about the plant with special safety apparatus whenever possible.

7. Protection of individuals from potential accidents when their work is hazardous by the wearing of special appliances as goggles, gloves, etc.
8. Frequent inspections of the physical conditions of plant combined with inspection of physical conditions of the human machines—the employees—will result in the prevention of the majority of accidents.

C. Fire prevention, protection from explosions, from collapse of buildings and other disasters of like nature have never been considered a feature of medical or surgical work, but the industrial surgeon, responsible for the health and safety of the employees, must likewise become an expert in the prevention of these disasters.

III. PREVENTION AS RELATED TO THE ACTIVITIES OF THE INDUSTRY

A. General rules of prevention as above laid down are applicable to all employees and to the physical conditions of all industries. But the industrial surgeon by a study of his special industry and the nature of the work carried on will discover many specific preventive measures which he must employ.

B. The railway surgeon will meet with traffic and transportation accidents which must be prevented. The physical condition of each employee must be carefully studied to see that he is not a potential cause for accidents to others.

C. The mine surgeon will need to study the hazards from gases, and other conditions pertinent to mine workers.

D. Munition manufacturing has introduced the need of medical men highly trained in the prevention of certain forms of poisoning.

E. The physician in charge of merchandizing concerns or of large office forces must study and prevent disease from overcrowding, from sedentary working habits, from poor ventilation.

F. Thus, the industrial surgeon must at the earliest opportunity acquaint himself with the activities of the industry as a whole and of each employee in order to competently meet his specific problems in prevention.

From a study of the above outline it is quite evident that *prevention* forms the very foundation of all industrial medical and surgical work. The industrial surgeon who neglects to approach his job from this angle is failing in his responsibilities to both the employee and employer.

The shortsighted policy of providing the cheapest kind of medical treatment to the injured or occupationally diseased employee without expending any money on the prevention of these conditions is rapidly becoming a thing of the past. The employer is realizing that cheap medical care is often the most expensive and that it is far more economical to prevent than to repair.

The company surgeon of the future must be thoroughly trained in preventive medicine and preventive surgery in their broadest aspects.

CHAPTER XV

INDUSTRIAL HYGIENE

A GENERAL OUTLINE OF THE PROBLEMS

Every industry has its specific problems of industrial hygiene which the surgeon in charge must endeavor to discover, master and correct or improve wherever possible.

Frequently some one of the official inspectors from the United States Public Health Service or from the Department of Labor report that the plant physician in a certain industry "did not know there was even an opportunity for lead poisoning in the processes carried on there;" or, "he didn't know a case of phosphorus poisoning when he saw one;" or, "he resented the statement that there were dust and fume hazards." Ignorance such as this on the part of the physician who is constantly on the job, and should therefore be the best informed in regard to local conditions, is inexcusable. It reflects upon the entire group of industrial physicians and surgeons. Unfortunately, the reputations of many company physicians in the past have been of the lowest standard professionally. Efforts to elevate the character and good name of this group of medical men by having their work recognized everywhere as of the highest standard are being made. Each surgeon in industry must do his part.

It is the solemn duty of every plant physician therefore to so improve the sanitary and other health conditions in his industry to the end that: the employees will have the greatest possible protection, the employers will receive the greatest possible benefits from these improved conditions, and the health work in the plant will be a model to others. Such an effort on the part of every company physician would be the greatest public health movement ever inaugurated in this country, and the men responsible for such a movement would take their places in the foremost ranks of our profession.

It is impossible to discuss all the specific problems of Industrial Hygiene which each plant physician will encounter in his industry, but the general conditions which must be considered in every case are herewith outlined.

Industrial Hygiene Problems to be considered in every concern come under one of these four groups: the nature of the industry, the physical conditions of the plant and its surroundings, the physical

condition of the employees, and the health conditions of the community.

I. Nature of the Industry and the various Processes and Occupations carried on:

A. What specific health hazards are present?

1. A study of all occupations, the material handled, the processes and motions involved and every other consideration which could influence health is necessary.

B. Hours of Work:

1. Are they excessive, acting as a detriment to health of employees?
2. Are rest periods, changes of occupations and other procedures allowed so as to avoid *fatigue?*
3. Is the night work especially hazardous to the employees?
4. Are Sunday and holiday rests observed?
5. Are washing periods, periods for going to toilet and other needed rest periods taken on company time?
6. Are the employees content with these conditions?

C. Nature of the Work:

1. Is the work of such a nature as to cause constant over-exertion?
2. Are labor saving devices utilized wherever possible?
3. Are the employees instructed in the best methods of doing the work so as to avoid hazards?
4. Are "bell-cow," "pacemakers" or driving methods used which may add to the exertion, nervous strain, or other fatigue conditions of the employees?[1] Is "piece-work," as carried on, detrimental?
5. Are safety devices used?
6. Are protection methods against occupational diseases, such as respirators, dust exhausts, hoods for removal of dangerous gases and fumes and all other devices in place and used by the employees?
7. Are the hazardous processes separated from the non-hazardous so that the employees in the latter are not unduly exposed?
8. Have you made careful studies to discover other occupational hazards, not usually classified in dangerous occupations, and reported the same?
9. Have you carefully instructed the management and employees in all hazards represented by their work and the

[1] The "bell-cow" is the fastest worker in a department pointed to as an example for the other employees.

best means of prevention? Are new employees instructed in the same before going to work?

D. Wages:

1. The right of the plant physician to be concerned in wages is often questioned by the management. However when insufficient wage is a direct or indirect cause for lowered health conditions among the employees it is the duty of the plant physician to point out these facts to the management. Such data should be carefully prepared and be irrefutable.

II. Physical Conditions of the Plant and its Surroundings:

A. Nature and Construction of Buildings:

1. Purpose building is used for?
2. Type of construction?
   (*a*) Is it sufficiently well built to stand the stress and strain placed upon it?
3. Are the stairways strong, sufficiently wide, adequate and protected against falls?
4. Are elevators adequate, inspected and sufficiently protected?
5. Floors:
   (*a*) Type of construction and nature of supports?
   (*b*) If wooden do they absorb dangerous material which may be given off in form of dust thus adding to hazards?
   (*c*) Are they level and well drained?
   (*d*) Are they clean? Is cleaning process done with least dust hazard?
   (*e*) Are they kept in good repair?
6. Walls and Partitions:
   (*a*) What is nature of construction?
   (*b*) Are the rooms divided by too many partitions thus making dark corners and non-ventilated areas?
   (*c*) Are the walls, partitions and ceilings clean and of proper color to be least injurious on eyes?
   (*d*) Are ceilings too low?
   (*e*) Are the rooms unnecessarily damp?
7. Fire Protection:
   (*a*) Are means of escape from buildings in case of fire adequate?
   (*b*) Is there a sprinkler system?
   (*c*) Are fire extinguishers provided and in sufficient numbers?
8. Is the building kept in a sanitary condition?

B. Surroundings:
1. Is the building located in a sanitary place?
2. Are the grounds clean, well drained and kept free of refuse and other material detrimental to health?
3. Does proximity of other buildings interfere with ventilation and sanitary conditions?
4. Do dangerous fumes, dusts, etc. from nearby industries interfere with health conditions in your plant?

C. Ventilation:
1. Is there overcrowding of the rooms or is air space sufficient?
2. If ventilation is natural is there sufficient window space, stairway space and elevator and air shafts to furnish adequate ventilation?
   (*a*) Are these spaces kept unobstructed?
3. Is there any artificial ventilation system used?
   (*a*) Are the suction fans and conducting pipes adequate?
   (*b*) Are blower systems installed over dust producing processes adequate?
   (*c*) If air is washed and used again is process satisfactory?
   (*d*) Does use of natural system with artificial interfere in latter? If so, which is best system to use?
   (*e*) Is the foul air, dust, etc. discharged so as not to reënter open windows again?

D. Humidity:
1. Any artificial means needed to keep humidity at proper ratio to temperature?
2. Are "wet-bulb" thermometer tests made frequently?

E. Temperature:
1. What is nature of heating plant?
2. Is temperature kept fairly constant?
3. Is there exposure to excessive heat and cold?
   (*a*) What precautions are taken to protect employees in this case?
4. Is an expert on ventilation, temperature and humidity employed or consulted to make sure that these are adequate?

F. Fumes and Gases:
1. If present from any of the processes are proper arrangements made for their removal?
2. Are the employees in other parts of the building protected from these?

G. Dusts:
1. Are proper facilities employed for removal of same?
2. Are employees in dusty occupations protected by respirators?
3. Are frequent changes from dusty occupations permitted the employees?
4. Is dry sweeping permitted?
5. Have you made a careful study of the hazards of the specific dusts in your industry?

H. Illumination:
1. Natural:
(*a*) Is the number of windows and light shafts sufficient?
(*b*) Are the windows kept clean?
2. Artificial:
(*a*) Direct or indirect lighting system?
(*b*) Are the lights properly placed and of uniform type?
(*c*) Are the bulbs and lamps kept clean and properly shaded?
(*d*) If spot lights are used do they interfere with adjacent employees, adding to their eye-strain?
(*e*) Are dark areas where employees must pass through illuminated?
3. Do employees complain of eye-strain and other effects of inadequate lighting?

I. Excessive Noises:
1. Have efforts been made to reduce excessive noise?
2. Are the excessively noisy occupations separated from the other processes?
3. Have you studied the effect of these noisy occupations upon the employees engaged in the same, especially as to hearing?
4. Are the employees engaged in the sedentary work removed from the strain of excessive noise?

J. Protection against spitting and refuse:
1. Are instructions against promiscuous spitting ample and enforced?
2. Is sufficient number of cuspidors provided?
3. Are these cleaned daily and is the cleaning thorough?
(*a*) Are they handled by hand or are the porters protected from handling the same?
(*b*) Is any effort toward sterilization made and is this successful?
4. Are receptacles for refuse provided and are these removed and cleansed daily?

FIG. 34.—A model office room. Note inverted lighting, ventilation shafts and general cleanliness. *(Courtesy Sears, Roebuck & Co.)*

5. Are provisions made for the obtaining and disposal of sanitary napkins by women employees?

K. Washing Facilities:
1. Is running water provided?
2. Is number of faucets sufficient for number of employees using them?
3. Are stationary bowls or troughs with continuous flow used and which is safer in your industry?
4. Are arrangements made for cleansing stationary bowls?
5. Are shower baths provided when necessary?
6. Are individual towels and soap furnished the employees or do they provide these for themselves? Has the use of roller towels been abandoned?
7. Are the wash rooms clean, light and located near the toilets and locker rooms?
8. Have the employees been instructed in the need of washing before eating?

L. Toilet Facilities:
1. Are sufficient number of toilets provided?
2. Are they clean, light, well ventilated and kept in good repair and in a sanitary condition at all times?
3. Are they inspected daily?
4. Have all modern improvements furnishing protection against disease been made?
5. If privies are used are these plentiful, clean and protected from flies? Are they sufficiently removed from working places?
6. Is sewage removal suitable and sanitary?

M. Locker Facilities:
1. Are the best type of lockers furnished?
2. Is the locker room airy, light and kept clean?
3. Is the smell from sweaty and dirty clothes obnoxious?
4. Is any arrangement made for drying the clothes if soaked by rain or snow on the way to work? (This is especially helpful in the case of women employees.)
5. Are the locker rooms periodically fumigated?

N. Eating Facilities:
1. Is a plant restaurant operated?
2. Is food prepared under best sanitary arrangements?
3. Are the chefs, waitresses and others handling the food periodically examined?
4. Are frequent inspections made?
5. If no restaurant at plant then is a proper place for eating of lunches provided?

6. Is an effort made to get employees out of working rooms at lunch hour?

O. Drinking Facilities:
1. Has the source of water supply been ascertained and inspected?
2. Has the water been chemically and bacteriologically examined and made safe?
3. Is it protected from pollution?
4. If a storage tank is used is it kept clean?
5. Is the use of common drinking cup abandoned?
6. Are bubbling fountains used and, if so, of a type to prevent spread of disease?
7. Is number and location of drinking places adequate and properly distributed so that employees will be furnished all the water needed?

P. Recreational Facilities:
1. Does the industry provide athletic fields, gymnasium, recreation rooms, library and other facilities for the employees to secure proper and necessary recreation?
2. Do the employees take advantage of them?
3. Does the medical staff take an active interest in them?

Q. Rest Rooms:
1. Are rest rooms with cots furnished for employees needing them because of fatigue or sickness developing while at work? (These are especially needed by women employees, but should be provided for men also.)
2. Are these placed in the most restful surroundings?
3. Is a proper person in attendance?

R. Doctor's Office and First Aid Station:
1. Is the number of employees and the nature of the work sufficient to warrant a central doctor's office at the plant?
2. Are first aid stations needed in other parts of the plant?
3. If no doctor's office is needed then is a first aid station provided?
4. Is the equipment of the doctor's office and aid stations sufficient for the best work?
5. Are the first aid men carefully instructed in their duties?
6. Are they used for first aid *only*, or is an effort made to have them replace doctors—a cheap form of service?

III. Physical Conditions of the Employees:

A. Physical Examinations:
1. Are the applicants for work examined and assigned to jobs according to their physical qualifications?

2. Are the employees examined periodically when engaged in occupations with disease hazards?
3. Are all old employees examined at intervals?
4. Is the working force protected from the diseased fellow employee when necessary?
5. Is a careful study made of the relationship between occupations and the employees physical and mental make-up?

B. Medical Care:
1. Is every preventive measure against both disease and injury installed and in use?
2. Is complete medical care furnished the employees and is this the best system?
3. Is proper supervision of the sick employee maintained to see that he receives the best treatment possible?
4. Is the medical staff competent and sufficient in number?
5. Are proper hospital facilities arranged for?
6. Are competent industrial nurses employed?

C. Provisions for Contagious Cases:
1. Is there any plan in force to discover contagious diseases early?
2. Are contagious cases isolated while awaiting transportation home?
3. Is the public properly protected against these contagious cases during their transportation home?
4. Are the rooms where contagious cases develop fumigated?

D. Recreation, Vacations, etc.:
1. Is proper recreation prescribed for employees to counteract fatigue and other work conditions?
2. Are vacations recommended to prevent threatened breakdowns?
3. Are occupations changed on recommendation of physician to prevent breakdowns?

E. Have the employees been properly instructed in all matters tending to improve health conditions?

F. Are the employees vaccinated, inoculated against typhoid fever or other diseases?

G. Are efforts made to relieve the employees of worries over sickness, debt and other family conditions?

H. Has every effort been made to secure proper co-operation between the management, the employees and the medical staff to improve health conditions?

IV. Health Conditions of the Community:

A. Co-operation between municipal health department and the medical staff of the industry:

1. Are contagious diseases properly reported?
2. Does the health department notify the plant physician of contagious diseases in the families of employees?
3. Do you co-operate with the health department to improve conditions about the plant and its surroundings?
4. Do you interest yourself in the health conditions of the community?

B. Home Conditions:

1. Are efforts made to improve the housing conditions of the employees in your industry?
2. Do the nurses visit the homes of employees and endeavor to improve conditions therein?

C. Community Conditions:

1. Does the management interest itself in community organizations such as churches, schools, hospitals, clubs, Y. M. C. A., Y. W. C. A., amusements, etc.?

3. Are proper hospital, dental and medical facilities furnished the families of employees?
4. Are there restrictions on saloons in the neighborhood of the industry and other protective measures against the excessive use of alcohol?

D. Is there co-operation between local industrial concerns to secure the best possible conditions in the community as regards the health, comfort and welfare of all wage-earners?

No physician in charge of the human maintenance department of an industry has fulfilled his mission until he has carefully considered the above problems in their relation to his work and taken steps to provide for their best solution.

The succeeding chapters will set forth in more or less detail some of the specific problems met with in industrial hygiene.

CHAPTER XVI

INDUSTRIAL HYGIENE

SPECIFIC PROBLEMS

For the technical discussion of many of the specific problems of industrial hygiene the reader is referred to the various works on sanitary engineering. In fact physicians will find that sanitary engineers are of the greatest value in establishing high standards of hygiene and there should be much closer co-operation between the two professions. In the army, sanitary engineers working with the medical officers have proven invaluable in developing military sanitation. Such engineers are already a definite part of the organization of many industries.

Dr. Paul Fox, who has devoted considerable time to the plant sanitation in one of the large industries of Chicago, has achieved excellent results by practical methods of meeting many of these problems. The author is indebted to him for most of the data concerning ventilation and disinfection. Fox says, "the underlying principles and the question of right and wrong in sanitation are distinctly a part of the physician's work. It is therefore imperative that he have some knowledge of the essentials of sanitation."

Ventilation

By ventilation we mean the supplying of air in sufficient quantities and of proper quality to make the room a healthful place in which to work. Perhaps no one factor reduces the efficiency of a workman so noticeably as does the lack of proper and adequate ventilation. "Bad air" causes many complaints among employees and often causes an entire department to lag behind in its production. It is therefore of great economic value to have the room so ventilated that the air will always be comfortable and invigorating, thus avoiding any mental or physical depression. In main we may say that a comfortable atmosphere is a healthful atmosphere, so that our problem, therefore, is largely one of making the room comfortable for the particular type of work which is being done.

In order to have a clear understanding of what constitutes "bad air," it is necessary to have some knowledge of the normal function of air, and of the means by which these functions normally maintain body comfort.

It is commonly known that air has two principal functions; one, is the physical, and the other chemical. By the physical property of air we mean the absorption or regulation of the body heat, while the chemical property, is the organization or the supplying of oxygen to the blood. If the air in a room is not constantly changed it soon becomes unable to perform either of these functions. The oxygen gradually is exhausted and the air becomes of such temperature and humidity that it is impossible for it to absorb the body heat. It has been thoroughly demonstrated that the physical factor causes distress far in advance of the chemical—in other words, a fault in the temperature, humidity or motion of the air will cause distressing symptoms, long before the lack of oxygen or the excess of carbon dioxid becomes apparent.

Complaints of "bad air" are therefore in the vast majority of causes due to the fact that the air in the room is of such quality that absorption of body heat is retarded. The former theory that "bad air" was air in which the oxygen was deficient or the carbon dioxid in excess, has long since been abandoned.[1] It is true that in certain industries poisonous gases are given off which cause toxic symptoms to the employees. However, this factor, although related to ventilation, properly belongs under the heading of occupational diseases and need not be discussed in this connection.

The present day conception of the principles of ventilation are clearly set forth in the following outline by Dr. Thomas R. Crowder.[2]

1. All trustworthy evidence goes to show that the normal expired air contains no volatile poison and that it is not capable of harming the human organism when rebreathed under the ordinary conditions of ventilation.

2. The increase of carbon dioxid and the decrease of oxygen have nothing to do with the ventilation problem under normal conditions, or with the subjective or objective effects of close air. Carbon dioxid is a necessary constituent of the air of the lungs; it is not to be considered as a poison or the index of a poison. Its proportion in the air of a room is a convenient and fairly accurate index of the quantitative air supply.

3. Air performs for the body a physical function (heat abstraction) which is quite as important as its chemical function (oxygen-supplying).

[1] Report of the Committee on the Ventilation of Cars. Transaction of the Section on Preventive Medicine and Public Health., Am. Med. Association, Chicago, 1911, p. 177. Paul: Ztschr. f. Hyg., 1905, xlix, 405; Flugge: Ztschr. f. Hyg., 1905, xlix, 363.

[2] Crowder: Study of Ventilation of Sleeping Cars. Archives of Internal Medicine, Jan., 1913, Vol. ii, p. 66.

4. The ordinary defects of ventilation lie with the physical function of the air and not with the chemical.

5. Temperature, humidity and air movement are the physical qualities of the air which are of importance in this relation.

6. The success of ventilation depends on whether or not these physical qualities of the air are so regulated as to maintain its physical function of heat abstraction without embarrassment to the reflex mechanism for the regulation of the body temperature. "The good effects of efficient ventilation and outdoor air depend on the coolness, the relative humidity and the motion of the air and the ceaseless variation of these qualities."

It will be seen from what has been said above, that for all practical purposes in ventilation, we can entirely disregard the oxygen and carbon dioxid content, and look entirely to the physical condition of the air. There are three factors which have to do with the successful performance of the physical functions of the air—namely, temperature, humidity and air motion. These three factors are interdependent and must all enter into any question of ventilation. Thus, when the humidity is low, or the air motion is great, a higher temperature is required than when with high humidity and slower motion.

Temperature

Temperature is by far the most important of these three factors and although intimately associated with humidity and air motion we can, for all practical purposes, say that if the temperature is properly regulated there will rarely be any complaint of poor ventilation. A stuffy room usually means a room in which the temperature is too high, thus interfering with the absorption of body heat. In rooms where the occupants are relatively inactive, the temperature should never be over 70°F. whereas if it is kept between 64° and 68°F. it will be of the greatest comfort. Where physical labor of moderate degree is performed a temperature of 60° will be most acceptable. Therefore the character of the work or the amount of exercise being taken by the occupants of the room, must be taken into consideration when determining the proper degree of temperature to be maintained.

Humidity

The relative amount of moisture in the air goes hand in hand with the temperature of the air. As nearly as can be estimated the relative humidity of the air should be about 50 per cent. (this may be measured by the wet and dry bulb or Taylor Hygrodeik, or by the Sling Psychrometer). However, the exact per cent. of humidity is a much debated question, and depends directly upon the temperature of the air, and upon the air motion. At 80°F. with moderate humid-

ity or at 70° to 73.5°F. with high humidity, practically all persons begin to show evidence of depression, headache, dizziness or a tendency to nausea. The ideal condition, therefore, would be a moderate temperature, not above 70°F. and a moderate humidity not above 50 per cent. The advisability of adding moisture to the air during the winter months is a much disputed question, and one which has not as yet been put upon a practicable basis as far as large institutions are concerned. From the theoretical standpoint it stands to reason, that the evaporation of water in a room during the winter months should be of great value. The cold air, as well known, has a lower point of saturation than warm air. If, therefore, we take the cold winter air into the room and heat it we cause a change which is similar in effect to a reduction in the amount of moisture.[1]

In this way we have an atmosphere which must be heated to an excessively high degree in order that it may be comfortable; thus producing air which is both overheated and overdry.

It is claimed by many authorities that the lack of moisture in the air during the winter months is responsible for many of the cases of colds, rhinitis, sore throats, etc., which are so prevalent during these months. As a matter of fact it is the excessive heat which is used to keep the dry air comfortable which is the main factor in lowering the resistance. There is also a possible factor of too rapid absorption of moisture from the body especially the nose and throat, which may be a factor in lowering resistance.

It is a well established fact that with a relatively high humidity a lower temperature will be found more comfortable. Thus it will be found that dry air heated to 72°, 74°, or even 80°F. will be less comfortable and will appear more chilly than a temperature of 66° or 68°F. when there is a greater degree of moisture in the air of the room. In a room in which the air is overheated and overdry the least movement of the air gives the sensation of drafts. If the moisture is increased and the temperature lowered the air will give the impression of balminess and its movements unless of considerable force, will cease to be noticed as drafts.

It may be said, therefore, that evaporation of water is advisable, when it is found that the relative humidity is low (below 50°) or that it is necessary to maintain an excessively high temperature (above 70°) to keep the room comfortable.

The following chart illustrates the method of determining what is at fault when there is a complaint of poor ventilation. It will be seen that the temperature was constantly too high (averaging over

[1] Hill and Flack: Influence of Ozone in Ventilation. Journal Royal Society of Arts, London, Feb. 9, 1912, p. 344. Roseman and Amoss: Organic Matter in the Expired Air. Journal Medical Research, 1911, xxv, 35.

72°F.). This together with a relatively high humidity made a very uncomfortable room. In this case the difficulty was entirely overcome by regulating the thermostat so that the temperature did not exceed 68°F.

Date	Time	Temp.	Humidity	
11/21/16	9 A.M.	72	58	388 employees in room
	11 A.M.	73	48	
	2 P.M.	70	48	
	5 P.M.	73	55	

Date	Time	Temp.	Humidity	
11/22/16 (Foggy day)	9 A.M.	71	62	416 employees in room
	11 A.M.	74	59	
	2 P.M.	75	48	
	5 P.M.	74	59	

Air Motion

From what has been said above, it is evident that air motion is intimately associated with temperature and humidity. If the temperature and humidity are high, as in the summer months, it is absolutely necessary to have air motion to maintain comfort. Whereas, with low temperature and low humidity even the slightest air currents cause marked effect upon metabolism and the loss of body heat. In rooms where the temperature and humidity are high, or where the temperature is high and the humidity relatively low it will be necessary to have air motion in order to have comfort. Just what rate of motion is necessary has not been clearly worked out and no standard can be established because effect of the air motion is absolutely dependent upon the temperature and humidity of the air. Professor Hill states that in his opinion slight but constant changes in the temperature and motion of the air lead to constant readjustments of the heat regulating mechanism of the body, and are very important in obtaining good results. It is his opinion that the impulsion of hot air into a room is the "most objectionable of all systems of ventilation, and that cold air entering in small jets, heated by direct radiation, is ideal."

Adequate ventilation has been recently defined by the Health Department of New York City as follows: "(1) The temperature of rooms during periods of occupancy should register preferably from 60° to 70°F. at all times, except when the outside temperature exceeds 60°. This does not apply to rooms used for special purposes, such as industrial places where high or low temperatures are essential and unavoidable. (2) The relative humidity in occupied rooms should not exceed 70 per cent., except when the outside (wet) bulb temperature

exceeds 59°. (3) The carbon dioxid in occupied rooms of all classes should not at any time exceed 10 parts in 10,000 volumes of air in any part of the occupied spaces of the rooms. (4) The dust particles in the air of occupied rooms in all classes of buildings should not exceed 1,000,000 per cubic foot. (5) The bacterial content should not exceed 100 per cubic foot. (6) The air of occupied rooms should be free from objectionable odors."

Disinfection

Fox again says: "The industrial physician should have complete supervision over all methods of disinfection. He should be in a position to pass judgment on every process which is in use and to make tests which will prove the efficiency or the inefficiency of any given process. It is clearly evident then that we must familiarize ourselves with the accepted methods in order to avoid some of the errors which are made along this line.

"Perhaps in no other branch of preventive medicine, has there been such a great fluctuation of opinion as in that of disinfection. The fact that there is such a large variety of disinfectants on the market is only evidence that we have been groping about for some powerful agent which will instantly kill pathogenic bacteria. M. J. Rosenau[1] of the U. S. Hygienic Laboratories most forcibly expressed this sentiment when he said:

"The stress of modern activities demands disinfecting processes that are instantaneous in their action, all pervading in their effect, cheap, harmless and free from any unpleasant odor. Such disinfectants are unknown. It requires time, money, and the expenditure of well directed and intelligent energy to accomplish satisfactory disinfection.

"Until recently it has been the tendency to rely too largly upon the chemical agents for the destruction of bacteria, and to ignore in a great measure the natural means we have at hand. Fresh air, sunshine, cleanliness, are by far the most important agents for destruction of bacteria and when these agents are brought into proper use, much money will be saved which is now foolishly wasted upon chemical disinfectants. It is not meant by the foregoing statement that chemical disinfection is entirely without virtue, but that entirely too much faith has been put in it to the neglect of other more effective natural methods. Proper disinfection includes the use of sunlight, fresh air, soap and water, liquid and gaseous disinfectants and above all, it implies that these agents must be used in their proper strength and allowed to act for the proper length of time. 'Whatever the method of disinfection adopted

[1] M. J. Rosenau: Disinfectants. Bulletin of Hygienic Laboratory.

or wherever it may be done, slip-shod methods can result in nothing but failure. If disinfection is worth doing at all, it is worth doing well. Careless disinfection is worse than none at all. The fact that a place has been disinfected gives the occupant a sense of safety. If the job has been done incompletely and inefficiently, this sense of security is unfounded and is a source of added danger.'[1]

"From the standpoint of the industrial physician it is important to know what methods are applicable in large institutions. It is the purpose of this chapter to give as briefly as possible the most accepted methods of disinfection and fumigation, and to give references which may help the reader in a further study of this subject.

"For practical purposes disinfecting agents may be divided into two classes, physical and chemical. The physical agents are sunlight, fresh air, cleanliness, heat, boiling and steam.

"Sunlight and fresh air are of great value and wherever possible a conscientious effort should be made to allow as much fresh air and sunlight into the workrooms as possible. This may be especially emphasized in the case of toilet rooms which are too often tucked into some dark corner, where fresh air and sunlight are impossible. Cleansing with the free use of soap and water and scrub brush plays an extremely important rôle in the disinfection in large institutions. It may be truly said that much more cleaning will be accomplished if the porters are given soap and water and a scrub brush and told to clean than when they are given a strong smelling disinfecting solution which they are lead to believe will destroy disease germs by merely mopping over the surface of the given article. Heat is made use of largely by burning contaminated articles. Boiling may be used for such articles as will not stand this process and cannot be destroyed. The article to be disinfected must be covered by boiling water for at least twenty minutes. Steam under pressure is a very effective disinfectant and is frequently used in the disinfection of cuspidors and like articles.

"Chemical disinfectants are divided into two classes (1) gaseous, (2) liquid.

Gaseous Disinfectants

"Of these formaldehyd and sulphur are of the greatest value. All crevices must be tightly sealed and kept so during the time of fumigation.

"In using formaldehyd, it is important that a sufficient quantity be used, that the gas be evolved rapidly, that the temperature of the air be above 60°F. if possible, and its humidity at least 60 per cent. of saturation. Unless the atmospheric conditions are naturally

[1] Disinfection—published by Illinois State Board of Health.

above these limitations, the defect should be overcome as much as possible by artificial heat, by placing shallow vessels of boiling water in the room, by sprinkling formalin on the floor and using an increased amount of formaldehyd."

Three methods of evolving formaldehyd gas are ordinarily available:

1. The permanganate-formalin method.
2. The formalin-lime and alum-sulphate method.
3. The spraying or sheet method.

1. **Permanganate-formalin Method.**—Use one pint of formalin and six and a half to eight ounces of permanganate of potash crystals for every 1000 cubic feet. Use a large galvanized iron or tin pail or can of at least ten quarts capacity for each pint of formalin.

Place the permanganate crystals in a thin even layer over the bottom. Place the pail containing the crystals in a pan or wash tub containing water, placing one or two bricks under the pail.

Put the formalin in a pail, dipper, pitcher or some other wide-mouthed vessel so that it can be poured quickly. Pour it from this over the crystals and depart. Close and seal the door of exit. This must be done quickly as the evolution of the gas is very rapid. Allow the room to remain closed for at least eight hours.

If the space to be fumigated exceeds 1000 cubic feet, a separate pail should be used for each pint of formalin or one which is proportionately taller to prevent the mixture from sputtering over on the floor.

Some slight danger from fire attends this process and it should be watched through a window during the few minutes necessary for its completion.

The present high price of permanganate has caused this process to be abandoned. One of the two following methods should be used until permanganate again approaches its former price.

2. **Formalin-lime and Aluminum Sulphate Method.**—Dissolve four (4) ounces of aluminum sulphate in one-half pint of hot water and allow the solution to stand for a few hours. Add one pint of formalin (35 to 40 per cent.) to this solution.

Take three pounds of unslaked lime and just before using break into small pieces and place in a pail as described under the permanganate method. The lime should be of a quality that will slake easily in cold water.

Pour the formalin-aluminum sulphate mixture over the lime as described in the permanganate method.

The above quantities should be used for each 1000 cubic feet of air space.

The time of exposure should be eight hours.

3. **Spray or Sheet Method.**—This method is efficient under favorable conditions of heat and moisture, when applied to rooms containing not more than 2000 cubic feet. Use at least 48 square feet of sheet surface for each pint of formalin and use this amount for each 1000 cubic feet of air space. The ordinary sheet 81 inches side by 96 inches long has an area of 54 square feet. This is a good size to use.

The sheet should first be dampened, so that the formalin will not run off when sprinkled on. However, it should not be wet. Spread each sheet over cords or lines, preferably so that they will hang at an angle of 45 degrees. Pour the formalin in an ordinary sprinkling pot and pour it on the sheet through the sprinkler. Any other spraying device may be used if more convenient. The formalin does not damage the sheets. The temperature of the room must be at least 60°F. or this method is not effective. Rooms disinfected by this method must remain closed at least eight hours. By using a number of sheets and several men to spray on the formaldehyd this method has been found very useful in fumigating departments after contagious cases have developed therein.

Sulphur Dioxid.—Sulphur dioxid in the dry state has practically no disinfecting power but in the presence of moisture it is changed into sulphurous acid gas and to a slight extent into sulphuric acid. It is these acids which are really the disinfecting agents. In the presence of moisture and in sufficient concentration it is effective in destroying disease producing germs but will not destroy spores. It is highly fatal to animal life and is especially applicable for destroying rats, flies, fleas, mosquitoes, lice and other vermin which may carry disease. It is much used, therefore, for disinfecting holds of ships, stables, barns, warehouses, freight cars and structures of this character.

In the presence of moisture it attacks most metals although this can be prevented by spreading vaselin over the exposed surfaces. It bleaches and injures cotton, linen and woolen fabrics, curtains, household furnishings, etc. It softens paint and varnish especially if they have been applied recently. It injures soap, coffee, tea, flour, sugar, matches, rice, etc., when they are freely exposed to it. It will also discolor wall paper and bleaches all vegetable and many anilin colors. The above mentioned ill effects only occur in the presence of moisture. Moisture, while essential to its action as a disinfectant, is not necessary when it is applied for the purpose of killing rats, insects or vermin.

Two methods of using sulphur dioxid are commonly used: (1) the pot method and (2) the liquid sulphur dioxid method, the latter being about ten times more expensive.

Owing to the fact that sulphur dioxid is rarely used for fumigating in industrial institutions, these methods will not be given in detail.

Liquid Disinfectants

There is a great variety of liquid disinfectants upon the market, some of which are useful but many of which are worthless. In the use of these chemical disinfectants there has been a great economic waste which in a large measure can be replaced by the use of soap and water. If, however, a chemical disinfectant is thought advisable only those should be used which have been thoroughly tested not only by laboratory but also by practical methods. In 1912 Thomas B. McClintic,[1] Public Health and Marine Hospital Service of the United States, conducted a very elaborate series of tests on various disinfectant solutions, and it is interesting to note that he found a large per cent. of the widely advertised disinfectants to be practically worthless. It is his conclusion that liquor cresolis compositus, U. S. P., is an excellent disinfectant from the standpoint of both efficiency and economy. It has a phenol coefficient of 3, and can be prepared on a large scale for about 50 cents per gallon Of course, the cost varies greatly with the scale upon which it is prepared. By the barrel, linseed oil and cresol can be obtained at about 80 cents and 50 cents per gallon, respectively. The commercial potassium hydroxid can be bought for a few cents per pound, or potash lye can be used in its stead. According to the United States Pharmacopeia liquor cresolis compositus (compound solution of cresol) is prepared as follows:

	Grams
Cresol	500
Linseed oil	350
Potassium hydroxid	80
Water, a sufficient quantity to make	1000

Dissolve the potassium hydroxid in 50 grams of water in a tarred dish, add the linseed oil, and mix thoroughly. Then add the cresol, and stir until a clear solution is produced; and, finally, add water sufficient to make the finished product weigh 1000 grams.

For the sake of completeness a few other liquid disinfectants may be mentioned.

Formalin—the 35 to 40 per cent. solution of formaldehyd gas—is a very efficient disinfectant, its great drawback being the irritation caused by the liberated gas. For this reason, it is not adapted to washing floors or walls although smaller surfaces may be satisfactorily treated with it. Formalin is not corrosive. Fabrics and other articles, except leathers, furs, and skins, are not usually injured by it. It is a good deodorant and is not apt to cause accidental poisoning. Its

[1] Thomas B. McClintic and John T. Anderson: 1. Methods of Standardizing Disinfectants. 2. The Determination of the Phenol Coefficient of some commercial disinfectants. Hygienic Laboratory Bulletin No. 82, 1912.

action is not retarded by albuminous matter and it is well adapted to the disinfection of urine, stools, sputum and other similar discharges. It will deodorize fecal matter almost instantly. A small quantity of pure or diluted formalin poured into water closet bowls, urinals, etc. will destroy offensive odors.

Carbolic Acid.—This is a useful disinfectant when used in a strength of at least 3 to 5 per cent. solution. In these strengths it is not destructive to fabrics, colors, metals, etc. It does not actively coagulate albumin and is therefore useful for the disinfection of bed linen, soiled clothes, stools, sputum, etc.

For disinfecting sputum, stools, etc. a 5 per cent. solution is added to an equal volume of the excretion, the mass then thoroughly mixed and allowed to stand for an hour before final disposal.

The Cresols.—The vast majority of the disinfectants sold to the public are mixtures of cresols (carbolic acid like substances) and soap, together with other inert tar oils, etc. Unless these disinfectants have a guaranteed phenol coefficient they should not be considered.

Bichlorid of Mercury.—This is a very powerful disinfectant when applied in sufficient strength to non-metallic and non-albuminous matter. It is highly corrosive and therefore is limited in its usage. The solutions usually used are of a strength of one part in 1000, or one part in 500 of water.

Lime.—Lime in certain of its forms is one of the best and cheapest of disinfectants and should be much more commonly used, especially for the disinfection of stools. It may be used either as quicklime or as freshly slaked lime in the form of whitewash or milk of lime.

1. Quicklime (calcium oxid), a very caustic substance, suitable to destroy any organic matter, is often used as a disinfectant.

2. Whitewash is simply a thin mixture of slaked lime with a little glue added to make it stick to the surface to which it is applied. Its uses are well known.

3. Milk of lime is prepared by mixing slaked lime with about four times its volume of water. Freshly slaked lime must be used and the mixture itself is of no value as a disinfectant after three or four days. It is very useful as a disinfectant for stools.

4. Chlorinated lime (hypochlorite of lime, "chlorid of lime," "hypochlorid," "bleaching powder"), when in a fresh condition, is a very effective disinfectant. For disinfecting stools and other organic matter, it may be used in a 5 per cent. solution or the dry powder may be added to the substance to be disinfected in an amount sufficient to make a 5 per cent. mixture. The mixture must be thorough.

A mixture of six ounces of chlorinated lime to the gallon of water is largely used for scrubbing floors and other surfaces.

Of recent years chlorinated lime or "hypochlorite" has been extensively used for disinfecting drinking water.

Proper Disinfection of Cuspidors

Proper disinfection of cuspidors has been one of the hardest problems with which we have had to cope. This problem is handled in a great variety of ways, from the use of the old sawdust boxes to the excellent system devised by Wm. J. Manning of the U. S. Printing Department. Any method of disinfection which falls short of sterilization by boiling or steam, or the complete destruction of the cuspidor by burning is merely a method of cleaning and can, therefore, be done just as thoroughly with soap and water as by the use of some high priced disinfectant solution. However, after a thorough cleansing it is advisable to add some liquid disinfectant such as a 5 per cent. of liquor creosote compound solution, in order that the disinfectant may act immediately and for a long time on the contaminated substance. The ideal method described by Wm. J. Manning[1] consists in having metal cuspidors which can be picked up by a special handle and conveyed by a special truck to a sterilization room. The cuspidors are emptied and washed out with hot water, and then exposed to a jet of steam for five to ten minutes.

This method has for its great advantage the absolute sterilization of the cuspidor and the fact that it is not necessary for the porters to touch the cuspidor at any time during the cleaning process.

Drinking Fountains

It should be one of the duties of the industrial physician to make frequent bacteriologic examinations of the source of water supply as well as to investigate the drinking cups or drinking fountains. Of recent years we have been placing considerable faith in the safety of ordinary drinking fountains. The fact that drinking fountains may be a source of contamination was demonstrated by Pettibone, Borgorl, and Clark,[2] University of Wisconsin, who were able to definitely prove that the drinking fountains of that institution were the source of contamination in the spreading of a grippe epidemic. Fifty-eight per cent. of the cultures taken from their drinking fountains during the epidemic showed positive cultures. Similar work has been done by other investigators with like results. Their remedy for this source of infection was to have a drinking fountain from which the water was ejected from a pipe at an angle of 15 degrees, thus preventing lip contact as well as droplet infection.

[1] William J. Manning: United States Printing Department.

[2] Pettibone, Borgorl, Clark: Journal Bact., 1916, 1, 471.

WASHING FACILITIES

Every employer should provide adequate sanitary washing facilities for his working force. Showers and bathing facilities should be included when the work involves contact with poisonous material.

The installation of stationary wash bowls with the common soap and common towel adjuncts so commonly seen in many industries has been responsible for much disease contamination. It is not at all uncommon to see an employee spit or blow his nose in one of these wash basins and then turn to the common roller towel and wipe his nose on this. Consider the ease with which disease could spread to the next employee who uses these!

Many states have legislated against the common towel but have neglected precautions with regard to the common wash basin and soap.

The following quotation from the Standards of the Federal Employees Compensation Commission shows what should be done in every industry concerning washing facilities and lockers:

"**Provision of Individual Wash Basin or Trough.**—No wash basins or troughs for common use should be installed. Facilities for washing hands and face should be such that employees must necessarily wash from the flowing stream.

NOTE.—The wash basin with stopper is unsanitary. This requirement is designed to prevent the transmission of disease through the common use of a washing fixture made to contain water.

"**Spacing of Fixtures.**—Fixtures for washing the hands and face should be spaced not less than 24 inches center to center so that a man can wash without splashing his neighbor.

"**Number of Faucets.**—The number of faucets for washing hands and face should be not less than one to every 6 employees, based upon the maximum number employed on any one shift in the departments using the equipment. Regular showers (see Sec. 7) may be substituted in part for these faucets.

"*Temperature Control.*—(*a*) Both hot and cold water feeding into a common spigot should be provided for each fixture and provision made for temperature control.

"(*b*) Wherever practicable, automatic thermostatic control should be installed in the main supply pipe to positively limit the maximum temperature to 125°F.

"**Clothes Hooks.**—An adequate number of clothes hooks shall be provided.

"**Soap Holders.**—Proper holders for soap shall be provided.

"**Showers.**—The number of showers should not be less than one to every twenty-five employees, based upon the maximum number of employed on any one shift in the departments using the equipment.

"This proportion may be varied according to the character of the work.

"*Showers to be Separated.*—The showers should be separated by partitions in order to encourage men to use the shower who would not otherwise do so; and to prevent the user splashing his neighbor.

"**Finish of Walls.**—The enclosure should be finished in a light color to give a neat appearance and facilitate cleaning (see also Sec. 3).

"**Hot and Cold Water.**—(*a*) Showers should have hot and cold water and be equipped with a hot and cold regulating valve.

NOTE.—The system should be arranged to prevent scalding. This does not necessarily imply the need of a thermostatic control for each shower in a battery of showers. Where such automatic control is necessary it can ordinarily be attached to the heater.

"(*b*) A regulating device should be so located that it can be operated without standing under the shower.

"**Location of Supply Pipes.**—Supply pipes to showers should be placed overhead to avoid the possibility of a person coming in contact with the hot pipes, and to facilitate the cleaning of the shower enclosures.

LOCKERS AND DRESSING ROOMS.

"**Number.**—A locker or other method for caring for change of clothing, etc., should be provided for each employee.

"Clothes lockers should be located in buildings or enclosures used in conjunction with washing facilities.

"**Material for Lockers.**—Lockers should be of steel and have proper ventilation. They should be at least 4 inches off the floor, to facilitate cleaning without contaminating the locker.

"**Size of Lockers.**—The size of the lockers should be not less than 12 inches by 15 inches floor space and of sufficient height to provide at least 5 feet clear height; where not set in wall they shall have gabled tops to prevent accumulation of rubbish and other materials."

TOILETS

Again quoting from the Employees Compensation Commission, we find the following recommendations:

"**Number of Installations of Toilets.**—There should be a number of small installations rather than a few large ones.

NOTE.—This is recommended so that available space in shops and yards may be utilized. If closets are conveniently located there will be less time lost and employees will be relieved promptly, which promotes good physical condition.

"**Number of Toilets.**—The number of seats should be not less than one to every 15 persons, based upon the maximum number of employees in any one shift in the department using the unit.

"**Specifications for Closets.**—(*a*) Closets should be of individual bowl type with individual water seal and should be made of porcelain or vitreous china, and not of enameled iron.

Note.—Flush range closets are considered unsanitary and similar to an open sewer and shall not be used. Enameled iron, of which the ranges are most commonly made soon corrodes, leaving the equipment in a deplorable condition. Flushing feces under others using the range is unsanitary, disagreeable, and objectionable. Individual closets made of porcelain or vitreous china overcome the objectionable features and provide a sanitary, durable, neat appearing bowl, which can be thoroughly cleaned.

"(*b*) The seat of each water closet should be made of wood or other non-heat absorbing material, coated with varnish or other finish which will make it impervious to water. Under no circumstances should the use of seats made of enameled ironware, procelain or other similar heat absorbing materials be allowed.

Note.—The use of non-heat absorbing material for seats eliminates any harmful effects which might come from men sitting on a cold surface.

"(*c*) The size of the opening should be at least 7 inches in width and 11 inches in length.

Note.—This size is recommended to insure the maintenance of a clean seat.

"**Specifications for Privies.**—(*a*) The hole in the seat should be of the same size as specified in rule 52 (*c*).

"(*b*) There should be a close-fitting cover for each hole.

Note.—Persons using the closet should be encouraged to keep the seat covered to prevent flies and other germ carrying insects coming in contact with the feces.

"**Provision of Washing Faucets in Toilet Rooms.**—Unless wash rooms are in close proximity to the closet, each closet room should be supplied with at least one washing faucet.

Note.—The installation of a washing faucet in a closet room, not in close proximity to a wash room, is to promote personal cleanliness by encouraging men to wash after using these facilities.

"**Number of Urinals.**—An adequate number of separate urinals should be placed throughout shops and yards located conveniently to the place where men work. An adequate number shall also be installed in each toilet room. The total number should be approximately 1 to every 30 employees.

Note.—This will avoid loss of time required for a man to walk some distance and will tend to avoid violation of sanitary rules. At least one urinal should be installed in each toilet room to discourage the unsanitary practice of using closets as urinals.

"**Specifications for Urinals.**—(*a*) Troughs and basins shall not be used for urinals. The wall or vertical slab urinal with proper flushing

should be used preferably to the porcelain stall. The floor in front of urinal must slope toward the drain."

The U. S. Department of Labor, the Committee on Labor of the Council of National Defense, and the New York, Pennsylvania, Ohio and Massachusetts Departments of Industry and Labor, as well as a few of the other states, have studied the problems of illumination, ventilation, fatigue and similar problems of industrial hygiene. The physician in industry is advised to obtain the bulletins published by these various agencies in order to gain a broad knowledge concerning these technical problems. A complete set of the bulletins prepared by the Council of National Defense can be secured by writing to the Bureau of Statistics, of the U. S. Department of Labor.

Recently the United States Public Health Service has made some thorough investigations of these subjects and their literature can likewise be obtained by writing to them.

The Committee on Hazardous Occupations for Women in Industry has prepared standards of sanitation which are especially applicable to this sex. These can also be secured from the Department of Labor.

It is exceedingly encouraging that the National Government is taking this great interest in industrial hygiene. Our country has lagged behind other governments in meeting these problems. Such an interest now bespeaks the approach of a real national health policy.

CHAPTER XVII

INDUSTRIAL HYGIENE AND PRODUCTION

The World War has focused attention upon Production. People who have given little thought to this problem in the past are now considering their responsibility toward producing the essentials, or toward conserving those things produced, necessary to the winning of the war.

Our allies have been solving this problem for four years and as a result have made changes in their industrial life which are revolutionary. Our own nation, for more than a year now, has been struggling with the same problem. No country has ever before been called upon to make such gigantic efforts and no country has ever succeeded in securing greater results in so short a time. But the cost has been terrific both financially and from the standpoint of wasted energy, and even of human life.

Our government, with the master minds in control, and the wholehearted, determined support of its people, has accomplished in a little more than a year what seemed the impossible. No criticisms, however valid, can overshadow the glory of this accomplishment. In the state of our unpreparedness it was only to be expected that excessive outlays of money, of energy and of human life would be necessary to meet this emergency.

During the short period that we have been in the war the world has seen a great army mobilized and thrown into the struggle—over a million and a half men already in Europe. It has seen a great emergency ship building program put into motion with an ever increasing number of ships being launched to carry this army and their needed supplies across the seas. Ordnance, munitions, quartermaster supplies, hospital supplies, locomotives, trucks, wagons, automobiles, gas offensive and gas defensive supplies, food and the other daily necessities of life for both men and animals, have been produced and transported in quantities heretofore unheard of. Even aeroplanes finally are being produced in great numbers. And in France the world has seen unbelievable feats of engineering performed. Great docks, for the receiving of these supplies, will remain after the war as part payment of our debt to heroic France and as a monument to our efforts. Great railway systems have been built meeting the problems of war

transportation now, and standing as a promise of the part which we must play in the rehabilitation of that country after the war.

No true American lives whose heart does not swell with pride when he contemplates the accomplishments of his country during this last year. And with true American spirit we have paid the price, and will continue to pay it without a murmur even though it is a hundred times as great.

All this the world has seen. But only a few see or realize the great efforts that are simultaneously being made by our government to conserve its man power, to utilize its human energy in the most economic manner and to reduce the cost of this mammoth undertaking to a minimum.

At the beginning of the war "business as usual" was felt to be a prime essential. It was realized that speeding-up of existing machinery and the creation of much new machinery would be necessary, but the economic and social existence of our country would be disturbed the least if this principle of "business as usual" could be maintained.

Gradually these business methods of the country are being revolutionized. Non-essential business is being curtailed and the employees are being diverted to essential production. The employers of the country are readjusting wages, and hours of labor, and are beginning to recognize that improved working conditions are necessary for maximum production. Many corrections have already been made. The labor unions are making concessions permitting of open shop methods, employment of women and arbitration policies which will do away with strikes. You can call it "business as usual" if you wish, but already we have a vision of those changes in industry which before the war were called the "dreams of idealists."

Changes are likewise taking place in the government. The existing governmental agencies were depended upon to do most of the war work, but to assist them numerous advisory committees were formed. That these committees, advisory in character but with no executive powers, were useful there is no gainsaying. But their greatest usefulness was the part which they have played in the transition of our peace time government. Slowly but surely we have seen these advisory committees replaced by executive boards and in turn these boards replaced by individuals who have the power to perfect, and are held responsible, for some definite part of this great war program.

Gradually the federal government has taken over more and more of the time honored rights of the states. And gradually the work of departments and bureaus has been centralized and unified. This has resulted in increased production with decreased cost chiefly by doing away with duplication of effort in the different departments. The

executive powers given by the Overman bill to our President have even greater functions than have as yet been revealed. The lubrication represented by doing away with interdepartmental jealousies, and the labor saving devices, represented by doing away with duplication of effort, have already given the country a smoother running machine with increased production.

No thinking man of to-day will deny that these changes in our social and economic existence, and these changes in the government itself, taking place because of war conditions, are here to stay.

No truer words were ever spoken than those of President Wilson when he said that this was a "War to make the world safe for Democracy." The victory over militarism and the autocracy of the Central Powers will not equal the victory over the tyranny and autocratic practices that have marked class distinction in all countries.

In the beginning this was a war against the efforts of Germany for the accession of more territory. Then it became a war for democracy. And now it is a war for social democracy. The need of *maximum production* to wage this war is the weapon which is gaining this victory for a true democracy.

Our Allies found that under the old relationships existing between employer and laborer maximum production could not be maintained. Changes were necessary and changes were made. These changes represent the getting together of labor and industry and the mutual adjustment of conditions. Labor could not force its contentions on industry. Neither could industry force labor to accept its views. The government could not arbitrarily decide for one or the other. But by conferences, by sacrificing radical principles on both sides, and by concessions on the part of the governments, whereby they assumed a share of certain losses to both, the new era of true democracy has been inaugurated.

In England shorter hours of labor have been established and careful studies reveal the fact that this has increased production. Wages have been increased, working conditions have been improved, protection against disease and accident hazards has been established and thousands of homes for employees have been built where better living conditions can be maintained—all of these have played a decided part in increasing production. The labor class of England has asked "If these things are essential for increasing production for war purposes, then why are they not quite as essential for increasing production in peace times?" And invariably the answer from all classes has been that these things are essential and must carry on after the war.

In our own land of freedom the "exploitation of labor" has been known, even the exploitation of woman and child labor. Before the war conditions were changing but it was a very slow process. With

the war this demand for production is bound to force these changes within the year.

The sacrifice of blood which we are making will bring its blessings in the form of these by-products of war—by-products which will mean a greater victory than merely overwhelming our enemy. Let us hope that if an early peace should come the country will nevertheless learn these lessons.

During the decade before the war our great industries in the United States made their greatest strides in efficiency. Better relationship

Fig. 35.—Model munition factory in England. Here women of all classes, under sanitary surroundings, are helping win this war.

between labor and the employer had been established. Wages and hours of work were better and more nearly uniform. The problems of labor turn-over, of hiring and firing and of unemployment had received more careful and more intelligent consideration. Better social conditions for the worker and his family were being recognized as an efficiency measure. The problem of the effect of alcohol on our industrial life was being met. Protection from occupational hazards and from accidents had been carefully studied and methods standardized. Experts in Industrial Engineering were being educated and turned out in ever increasing numbers.

Above all the principles of industrial hygiene had been evolved and were already installed in many concerns. Physicians, highly trained

and reputable, were more and more entering the field of industrial medicine and surgery.

Thus, without knowing it the nation was undergoing a state of preparedness. And during these days when maximum production is the cry of the hour the influence of all this work is being felt. The principles of industrial hygiene are now recognized as the very foundation of maximum production.

During the first year of the war the speeding-up, the forming of new industries, and the great demand on the old, threw labor and industrial conditions into a frightful state. The housing conditions for employees in many centers were soon overtaxed and became intolerable. Beds were used day and night in three shifts. Sanitary conditions deteriorated rapidly due to the increased demands on water-supplies, sewage systems, etc. Shops were overcrowded. The food supply was inadequate and profiteering became rampant. Men from nearby towns flocked to industrial centers to work and lost time and forfeited wages because of transportation conditions.

The percentage of labor turn-over increased to over 1000 per cent. in some cases. Employees, discontented with the above conditions and influenced by the promise of higher wages from other concerns, would leave their jobs without notice. Two concerns, equally necessary to war production, would influence employees to leave one or the other.

These conditions in the industries and homes added greatly to the sick-rate. The floating labor was a means of spreading diseases. "Green hands" added to the accident rate to a very marked degree. The lack of any effort to select men for proper work according to physical qualifications added to the inefficiency of the working forces. The lack of precautions against occupational disease in our munition factories added to the toll of war victims. The wonder is that production attained its present proportions.

But during this period many different agencies of the government were at work to correct these conditions. The National Defense Council through its sections on Labor and on Medicine early drew up standards on many important industrial hygiene methods and circulated these freely. As it was only an advisory body however, it could not enforce these methods. The Women's Committee of the National Defense Council, "Department of Women in Industry," the Women's Division of the Department of Labor, the Women's Division of the Ordnance Department, and the various women's divisions of the State Defense Councils have all contributed studies and recommendations tending to improve conditions for women in industry. All such improvements will naturally better working conditions for both men and women. The great drawback to all these committees

was that they had advisory functions only. During the last few months three important groups have been designated by the Federal government to correct these industrial conditions. Their work is bound to speed up production. All of these have a direct bearing on industrial hygiene. In fact the surgeon familiar with industrial practices is represented in each group.

Without discussing the other functions of these bodies we will consider here only those functions which have a direct bearing on industrial hygiene and its relation to production.

Early in the present year the Department of Labor underwent a reorganization. It formed its bureau of War Labor Administration and took specialists from all over the country and placed them as Chiefs of Divisions. These men and women are responsible for the administration and results of their divisions. Already the labor supply is being controlled and dealt out and shifted according to priority importance. Large groups of field workers have been formed to study industrial and labor conditions throughout the country. The work of other sections and committees is being co-ordinated and there is less duplication of effort. It is to be hoped that all committees working on labor problems will be forced to do so under a general plan outlined by this Labor Administration. The executive powers of this Labor Administration are sufficient to enforce correction of many of the conditions which have heretofore slowed up production. Unless this is done their scope of usefulness will not exceed that of the various advisory committees.

The Women's Division of the Department of Labor has recently been placed under the direction of Miss Mary Van Kleeck. A committee representing the Office of the Surgeon General of the Army, the Ordnance Department, the Navy, the United States Public Health Service, the National Research Bureau, the War Industries Board, the Bureau of Standards and other divisions of the Department of Labor was formed in June (1918) to act as a steering committee for the Women's Division. Through their work several investigations of specific industries where women are employed have been made and reports submitted showing the hazards of this work and what corrective measures are necessary. In most places the employers have shown a very marked co-operative spirit and have taken steps to improve conditions on the recommendations of the committee.

The real value of this committee's work and of all other such agencies will depend upon the support given to them by the government. Will the failure to meet their recommendations in a given industry, where conditions are detrimental to the health of both men and women employees, be sufficient grounds for the commandeering of that industry? If so will the government act?

The commandeering law states that "wherever production is obstructed" such a step can be taken. The hygienic conditions of a plant are often such that production is obstructed, first by the undue amount of sickness resulting, and second because of the excessive labor turn-over, the result of poor working conditions.

If commandeering proceedings should be adopted on these grounds it will be the first time in the history of the country that the Federal government has interfered with private corporations because of lack of protection of the health of employees. Such a precedent would have most beneficial results on the public health of the nation.

The second group which is working along the lines of industrial hygiene is the Federal Housing Commission. By improving the housing conditions of employees one of the most important steps for conserving labor will have been taken. Better housing conditions means better and more sanitary living conditions, a healthier, more contented working force, less labor turn-over and greater production. An opportunity is given to this commission to re-establish homes in our industrial centers, homes which were rapidly being displaced by tenements and other cheap forms of abode.

On July 1st of this year the President issued an executive order, under the powers given him to co-ordinate the work of various departments, which will have the most far reaching effects of any health measure ever enacted in this country providing those in charge of the work will see their opportunity and take full advantage of it. This order states that "all sanitary or public health activities carried on by any executive bureau, agency, or office, especially created for or concerned in the prosecution of the existing war, shall be exercised under the supervision and control of the Secretary of the Treasury." The only exception to this is the work of the medical departments of the Army and Navy. The order designates the U. S. Public Health Service of the Treasury Department as the agency which should carry on this work.

It is recognized by the Public Health Service, and by all familiar with its activities, that the most important work it is doing is that of its Industrial Hygiene Section. This order therefore should enable the expansion of its Industrial Hygiene work to include every industry in the country which is concerned either directly or indirectly in the production of material necessary to the continuance of the war.

When we realize that the Department of Labor has had at least two groups, with physicians employed, working in this field of industrial hygiene, and that the Bureau of Mines has had a medical department working in the same field and that at least five other medical divisions of the various departments and commissions have been working on public health matters, then we can better understand the importance of

this executive order. The duplication of function in this field of public health has been a decided factor in retarding results. It is the plan of the Surgeon General of the Public Health Service not to destroy or duplicate the good work which has been done by these various agencies, but to co-ordinate their work and henceforth co-operate under one general plan of procedure.

Already the Public Health Service has thoroughly co-operated in the work of the Women's Division of the Department of Labor by making the field studies in Industrial Hygiene in certain chemical industries and turning the results over to this Division.

Since experiences in this country and abroad have demonstrated so clearly that the principles of Industrial Hygiene, where carried out, always result in increased production, it is evident that the recommendations of the Public Health Service should receive respectful attention by employers at this time. If faulty conditions are left uncorrected, and as a result lowered health conditions among employees slow up production, it would seem logical for the federal government to take over and operate these concerns under the most up-to-date methods.

Last October a committee was formed in the Medical Section of the Council of National Defense consisting of members from the American Association of Industrial Physicians and Surgeons and from the American Railway Surgeons Association, known as the Committee on Industrial Medicine and Surgery. This committee was reorganized in March of this year to include in its membership representatives of the United States Public Health Service, the Department of Agriculture, the Department of the Interior, the Department of Commerce, the Department of Labor, organized industry, organized labor, organized medicine, organized Industrial medicine and the Medical Department of the Army.

While its functions were only advisory yet there is no question but that the studies and report of this Committee on Industrial Medicine and Surgery have been strongly instrumental in bringing about the present status of industrial hygiene in its relation to war production.

Just what the relationship is between industrial hygiene and production can best be explained by quoting from the report of this committee prepared by its director, Dr. Otto Geier:

"**The Need of the Hour.**—More production of war materials by the second line of defense.

"**Slowing down of industry caused**—1. By excessive labor turnover. Men drifting from shop to shop, therefore untrained and with low output—more subject also to accident on successive new jobs.

"2. By physical breakdown: (*a*) Due to unsanitary conditions of

shop and homes (lack of medical supervision). (*b*) Due to lack of early recognition and prompt treatment of ailments leading to invalidism.

"3. By absence from work: (*a*) Due to preventable accidents. (*b*) Due to failure to secure prompt and efficient surgical attention when injured.

"4. By lack of output because of those killed or permanently disabled (number said to be more annually than thirty times the number of soldiers expected to be permanently disabled, and for which millions have been provided in the way of reconstruction facilities).

"Production can be Definitely Speeded up by Protection of the Human Machinery from Preventable and Unnecessary Wear and Tear, Disease and Injury.—The non-effectives in the average industry are known to be at least 3 per cent. or 30 in each 1000 on account of sickness (study of 750,000 workers, U.S.P.H.S.), may go as high in others as 6 per cent. of non-effectives. Add to this factor an additional per cent. for absence, falsely claimed to be due to sickness; then add one-half of 1 per cent. for absence on account of lost time due to accidents and we have a total absence of 6 per cent. to which medical men can direct their efforts.

"The *principles of industrial medicine and surgery* intelligently applied can reduce this 6 per cent. loss to 3 per cent., making a gain of 30 workers on the job in every 1000.

"*Additional Saving.*—A cleaner plant and healthier workmen will result in a greater output per man.

"*Other By-products.*—Better relations between employer and employee—more sympathetic understanding—comforts and conveniences, cafeterias, etc., supplied; all producing a better *esprit de corps* resulting in less labor turn-over.

"*The protection of the health of the community*—women and children—quite as essential as the health of the workers. Fully 30 per cent. of the effective medical and surgical capacity of the profession has been drawn into the Army. Twenty-four per cent. of the visiting hospital forces has been called into the service. This indicates that the civil population does not possess adequate medical service. Under strain of war conditions, disease and injury are increased. To meet the discrepancy, a method must be found by which every physician not in the Army may give his maximum result with his minimum effort, so that the community may be adequately protected against disease.

"The placing of the physician in industry accomplishes that need. By applying his preventive measures to the large industrial unit on an intensive scale, the industrial physician assists the community in

its health efforts, lessens disease, and therefore lessens the strain on the physicians in private practice.

"*Our problem therefore is:* 1. To meet the military need for greatly increased production.

"2. To offset the drain on the man power in industry brought about by raising the military force.

"3. To assure adequate medical sevrice for the civil population.

"*To meet the problem, the government must:* 1. Provide against unnecessary human waste in industry and society during the war.

"2. Increase output by maintaining workers in good health.

"3. Avoid preventable deaths and disabilities from accident and disease.

"4. Restore to full producing power in the shortest possible time the sick and injured workers.

"5. Provide healthful places in which to work.

"6. Provide healthful homes and communities in which to live."

It is still too early to report great progress in this country in these matters of improved health conditions for working men and women. But the start which has been made augurs great things for the future.

The Ship-building Board was one of the first large governmental war machines to recognize the need of introducing industrial hygiene, and its allies, prevention of accidents and adequate medical and surgical care, into all its yards as a means of maintaining and increasing production. The health conditions of many of the communities about these yards have been permanently improved by the drastic action of this Board. For example large areas in New Jersey have been drained and other steps taken to rid them of mosquitoes and the resulting malaria. In one town a large dump heap was so infested with rats as to be a constant menace to health. A successful rat extermination campaign was carried out. These examples point out the lesson that industrial hygiene to be successful must not stop within the confines of the industry itself. Thus far this work has been conducted under the direction of a medical officer from the Medical Department of the Army.

In all of the arsenals, ordnance depots and most of the government owned munition plants a comprehensive system of industrial medicine and surgery has been or is being installed.

The division of Sanitation and Safety, an organization of the Industrial Service Section of the Ordnance Department has been instrumental in improving the conditions in many of the industries engaged in the manufacture of ordnance supplies. Their work has just started and promises to yield excellent results.

The United States Employees Compensation Commission has recently placed safety engineers in many government industries where

civilians are employed and by co-operating with the United States Public Health Service and with the Medical Department of the Army has been able to start systems of industrial hygiene in several such industries. By arrangements recently made between this commission and the Surgeon General injured civilian employees from some of these government industries have been admitted to the military hospital for the blind at Baltimore to receive the same re-educational advantages which have been prepared for the blinded soldiers. If the government will extend this opportunity for reconstruction, and re-education when necessary, to the civilian employee—the industrial soldier—which it is giving to the military disabled soldier, then it will be more nearly meeting its full obligation to its citizens.

The Railroad Administration has its safety department and is co-operating with the medical departments of railroads to improve health conditions for railway employees.

We have a few examples of an active interest on the part of state governments in industrial health conditions, but these are the first examples of an active, constructive federal program for introducing industrial hygiene into specific industries.

The importance of this step, and the ever increasing results which it will have may not be fully appreciated by many. But to those surgeons in industry who have devoted many years of their lives to establishing these principles of industrial hygiene, and to their lay allies, who have so thoroughly supported and abetted their efforts, the dawn of a new day has come; never again will we return to those dark ages when the human machine was worked to the limit without supervision and then prematurely scrapped because of a breakdown, often the direct result of the occupation.

By the time this book is published the contents of this chapter will be ancient history considering the rapidity with which advances are being made.

However, it is history which shows the signs of the time pointing ever to one inevitable solution of these problems of Industrial Hygiene and Public Health, namely, a centralized, federal Department of Health *with power to act.*

CHAPTER XVIII

EPIDEMIOLOGY IN INDUSTRY

ACUTE RESPIRATORY INFECTIONS, ACUTE CONTAGIOUS DISEASES, TYPHOID FEVER, ETC.

The prevention of the spread of epidemic diseases among employees is one of the most important duties of the medical staff. This function has not been sufficiently recognized in the past; or, in speaking of epidemics, we have thought only of the acute exanthemata and limited our efforts to their prevention.

Wide experience in industrial practice has convinced several physicians that many diseases, not heretofore recognized as such, were infectious. Even those conditions, usually considered as symptoms, and which attack one for a few hours or a day and are so commonplace as not to drive the patient to a doctor, are seen by the physician in industry. Epidemics of these ordinary conditions frequently occur and cause great loss in the efficiency of the working force even though no actual loss of time from work results. The following examples will better illustrate these minor epidemics.

Colds.—These are so ordinary that both patients and physicians have adopted an attitude of indifference and tolerance toward them: yet the damage from "colds" to the human system and the economic loss to industry cannot be estimated. In the winter months this condition is so widespread that its epidemic nature might be doubted, the real cause being considered due to weather conditions and exposure to the same.

However, the author has witnessed many epidemics of "colds" in the summer months. For example, in the month of July, with the most ideal working conditions, six or eight employees from the same department would report to the doctor's office with "colds." The next day fifteen or twenty other employees from this department would report with the same condition. This mild epidemic might be limited to this department but usually a great number of people from other portions of the plant would be attacked by the same condition.

The signs and symptoms of these "colds" take various forms but the epidemics are usually of the same type. At one time all the employees reporting will have a profuse, thin nasal discharge, while again the coryza will be very slight and most of the cases will complain of hoarseness. Another time the "colds" will be accompanied with

signs of sinus infection and headaches and the majority of the cases will show this involvement. I have seen ten girl employees from the same department report during the course of a day with slight "colds" and herpes.

These experiences have occurred so frequently that one cannot doubt the contagiousness of "colds." Educational campaigns among the employees are the best means of combating these epidemics. Warnings against the spread of the condition; instructions as to eating, rest, care of bowels, bathing, dress and other habits; protection of fellow employees by care in handling the handkerchief, washing of the hands, covering the mouth in sneezing, never using the common towel or cup, keeping things that might be handled by others out of the mouth, and hundreds of other like suggestions, can be made. When "colds" show signs of becoming epidemic it is much more economical to the concern to send these employees home. The active treatment of all cases of "colds" by the medical staff while they remain at work is very efficacious in controlling this condition. Separate the employee as far as possible from his fellow employees. Have him report to the doctor's office three times a day and gently swab the nasal passages with 10 per cent. argyrol, spray with a weak solution of dichloramine-T or inhale the fumes from hot tincture of benzoin. These methods adopted early will abort many cases. Urotropin in five grain doses, often repeated, is of benefit. But the surest methods are isolation and education.

A wonderful opportunity is given these physicians in industry to study this condition and evolve the best form of treatment and the best means of preventing "colds." We have neglected this disease because familiarity with it has bred contempt.

Lumbago.—Lumbago occurs in endemic forms and frequently in such proportions as to indicate an epidemic. It is not limited to departments as in the case of "colds" but often during the course of a week fifty or more cases of this condition will report. I have seen ten men in the examining room at the same time all complaining of pain in the back. Men are more susceptible to this than women.

Torticollis or "stiff neck" has also appeared at the same time and in numbers suggesting a mild epidemic. One morning in early fall the author arose with a stiff neck. While at breakfast his sister, who had been with him the night before, phoned and asked what she could do for a stiff neck. At the plant that morning fourteen employees reported complaining of stiff necks, four were from the same department. At his office in the same afternoon one patient called on account of this condition. On the same day and for several days following lumbago was very prevalent among the employees.

The real origin of these conditions is undoubtedly from some focus

of infection within the patient's own body. In the case of both stiff neck and lumbago, diseased teeth, hypertrophied tonsils, or a chronic coryza can usually be found. Nevertheless when there is a sudden flare-up of these conditions in a number of people at the same time one is forced to speculate on the possibility of a spread of the trouble from one individual to another, or on what changes in the weather or the environment cause a lowered resistance among individuals with an increased virulence in the infecting organism.

These minor conditions, so long considered as a necessary annoyance in our everyday life, need careful study and analysis. The reduction in their occurrence will be one of the greatest economies in the industrial world.

TONSILLITIS—INFLUENZA—PNEUMONIA

The acute respiratory infections have become more and more prevalent during the last five years. Employees have always lost considerable time, especially during the winter months, from these causes, but recently they have occurred in such numbers as to be classed as epidemics. Time and again the absenteeism has reached such a high rate as to materially interfere in production and output. The efforts to prevent these epidemics have caused the physician in industry more worry than almost any other condition.

These acute respiratory conditions have occurred as epidemics of tonsillitis, usually the severe form of streptococcic sore throat; influenza or "grippe;" pneumonia, especially streptococcic pneumonia, and bronchopneumonia; with their complications.

Previous to 1912 the employees in the concern the author was connected with were not affected to any unusual degree by these diseases. But in 1912 the working force was swept with an epidemic of severe colds and tonsillitis. Again in the winter of 1913 an epidemic of tonsillitis occurred. These cases were usually of a severe streptococcic form and accompanied by many complications. These epidemics were widespread but Chicago seemed especially affected. Capps and Miller and Preble of that city all described the condition as a hemolytic streptococcus infection. Milk was thought by them to be the agency through which it was carried.

In 1914 the condition was not so serious but beginning in the early winter of 1915 and continuing until March, 1916, the entire country was included in an epidemic of so-called "grippe" which was most frequently complicated by pneumonia. In 1916 this disease was prevalent but not to any such extent as the previous year.

We all know the fearful toll which these acute respiratory diseases have claimed in our Army during the last year and a half. At their outset they have taken various forms. In some camps measles and

mumps were the starting point of the epidemic, followed by influenza, pneumonia, pleurisy with effusion and empyema. Practically all of the reports show the hemolytic streptococcus with or without pneumococci, Types I, II, III and IV, as the commonest organism in these epidemics among the soldiers. In some camps the epidemic began as influenza; in others epidemics of primary streptococcic pneumonia were reported, while in still others the epidemic was secondary to the acute exanthemata.

In industry the same conditions, usually classed as influenza, have been claiming their toll from the civilian population. I am told by some physicians in industry that these epidemics do not differ to any extent from the epidemic of 1915 except empyema as a complication has been more prevalent.

This hasty résumé demonstrates that these acute respiratory infections have been gradually increasing in this country for the last six years. Each new epidemic has undoubtedly increased the virulence of these infecting organisms. The crowding together of thousands of young men in camps facilitated the spread of the disease. At the same time the speeding up of industry and the overcrowding that was necessary because of the war emergency made excellent epidemic environment.

A description of the epidemic of 1915 written by the author is in the main characteristic of all these acute respiratory epidemics which undoubtedly are very closely related in both cause and effect.

During December, 1915, and January and February, 1916, our country, especially the Northern States, was swept with an epidemic resembling in almost all of its aspects the pandemic disease known as influenza which swept over the entire world in 1889 and 1890. From all reports, the East—New York, New Jersey, Pennsylvania and Ohio—and the Northwestern States—especially Minnesota and North and South Dakota and extending into Canada, suffered to the greatest extent from this epidemic.

Because of our medical work among the employees of certain large industries in Chicago and through the various channels of examining employees for occupational diseases, we had an unusual opportunity of studying over 1800 cases affected by this epidemic disease.

Etiology.—Clinically, the disease corresponded in practically all of its aspects with the old epidemic of influenza so well described by Osler, Laden and Senator, and Lichtenstern, and many others following the epidemic of 1890. But from a bacteriologic standpoint, we did not find the bacillus of influenza as described by Pfeiffer in 1892. From twenty-five blood cultures and a great number of cultures made from the secretions from the nose and throat of the affected individual, grown on blood agar, the organism usually found was a

hemolytic streptococcus, often associated with the pneumococcus. Unfortunately the isolation of the various types of pneumococci were not carried out in 1915 as they are to-day.

During the winter of 1912–13, especially during January and February, Chicago was swept by an epidemic of a very severe form of tonsillitis. At the same time there was an epidemic resembling very much the old so-called catarrhal fever, characterized by a severe coryza and a tendency for the infection to spread to the sinuses, especially the frontal sinus and the antrum. The cases were often quite severe and the course of the disease prolonged. Bacteriologic studies of these epidemics were made by many observers, but as a rule either a hemolytic streptococcus or a diplococcus was found as the cause of the infection. Again, last winter we had an epidemic characterized by fewer cases of tonsillitis, but by more cases of the nasal infection and accompanied by pharyngitis, laryngitis, and often bronchitis. Again the streptococcus and diplococcus were found as the most frequent organisms in the nasal and throat secretion of these cases. As in the present epidemic, the patients were usually told that they had the "grippe," although as pointed out the influenza bacillus had not been found in any of these epidemics of the last three years.

Lichtenstern, in his article in Nothnagel's Handbuch, in 1898, pointed out the relationship between the epidemic influenza to the ordinary influenza cold or catarrhal fever, which is usually present in all communities. He makes three divisions: First, the pandemic influenza, vera, caused by the Pfeiffer bacillus; second, epidemic influenza, vera, which develops for several years in succession after a pandemic and is also caused by the same bacillus; third, the endemic influenza or pseudo-influenza or catarrhal fever, commonly called the "grippe" and which is due to an unknown organism.

During the period from 1912 to 1915, in the winter months, we witnessed an epidemic increasing in severity until it culminated in the disastrous epidemic of 1915–16 and resembled clinically the true influenza disease. But, instead of the influenza bacillus, the hemolytic streptococcus mixed with the pneumococcus has been the real cause of these epidemics.

The disease was highly contagious. When a member of a family was stricken, it usually attacked the entire household. It spread throughout the schoolroom, attacking both the teachers and the pupils. The most significant feature of the contagion was the way in which it spread among the clerical forces of the department stores and among the employees of those industries which were forced to speed up, to work overtime and to take on extra employees in order to handle the Christmas rush of business. In one office, which is always rushed to the limit by increased Christmas business, 50 per cent. of the office

force was caught by this epidemic. In certain industries, or in departments which were not affected by this extra Christmas work, the disease did not spread to any extent, and frequently missed them altogether.

Whenever one or two cases developed in a room containing a great many employees, it was not uncommon to see sixty or eighty cases develop in that same room, within the course of a week. In many industries, a vicious *circle* was easily developed. The excess of work caused a spread of the disease, and the more employees that became sick, the harder did the others have to work. Those employed in outside work suffered far less than the inside workers. The hospitals, especially such institutions as the Cook County Hospital were overcrowded with patients. As a result, the nurses and hospital help were greatly overworked. The disease spread with alarming rapidity among the nurses. One hospital had 25 per cent. of their nurses sick at one time. Due to being "too busy," a great many of the above employees, and very likely the nurses neglected their bowels—constipation resulted; many neglected to eat their regular meals or to take sufficient time to eat; and many, due to working overtime, did not get sufficient sleep or time to recuperate from one day to the next.

From a study of the above facts, it would seem that the chief predisposing causes to the spread of this epidemic were overwork (especially inside work), overcrowding, and the neglect of the fundamental principles of health—namely, sufficient food and rest, regular mealtimes, and proper elimination.

The spread of this disease from one individual to another was undoubtedly through the nasal and respiratory secretions carried by the infected dust and other material of the working room. The actual onset of the disease was usually preceded by a coryza, sneezing, and the ordinary symptoms of "catching cold." Undoubtedly the careless sneezing and careless flipping about of the soiled handkerchief of the affected individual was the commonest means of communicating the infection to his fellow workers, fellow passengers in the street car, or any others who came in close contact with him. Other sources were careless spitting, careless blowing of the nose without using a handkerchief, the common towel, which can so easily collect secretions from the nose or mouth, the common drinking cup, kissing, and the handling of articles used by the affected individual. One had only to walk through our busy shopping districts, just prior to Christmas in order to see how many of both the clerks and the customers had "colds;" to see how frequently and how carelessly handkerchiefs were jerked from pockets and shaken in the air in order to spread them out; to behold customers sneezing into their hands, then handling articles which were later bought by other

purchasers; and to note the overcrowding everywhere, especially in the ill-ventilated basement salesrooms, in order to understand how such an epidemic could spread to almost every household in the city. In fact, one marvels that anybody escaped.

Symptoms.—We had the unusual opportunity of seeing several hundreds of these cases of this epidemic disease at their onset, plus the questionable privilege of studying the disease as fellow sufferers. The majority of the cases reported to the doctor because of a severe cold in the head, a slight sore throat, and a general aching throughout the body, usually complaining of backache, legache, or headache, in the order named. In every case the temperature and pulse were taken at once, and, as a rule, fever was always present, varying from 100 to 103. The pulse was invariably slow in comparison to this temperature, averaging from 80 to 90. Some of these complained of a severe cough, but as a rule the bronchitis symptoms developed later. In practically all cases, there was a history of prodromal symptoms, varying from one or two days to a week, such as a marked coryza or sneezing, headaches, or a general feeling of lassitude. Many complained of constipation and others of sleeplessness and loss of appetite.

In about 5 per cent. of the cases the onset was that of a gastro-intestinal disturbance. Nausea was marked, frequently there would be severe vomiting. Occasionally diarrhea was present, but constipation was the rule. Frequently, severe abdominal pains were complained of, and oftenest the pain was located in the left hypochondriac region, near the spleen. Fever was practically always present. Because of the abdominal symptoms a blood count was usually made, but it was seldom that the leukocytes were above 14,000. In a smaller percentage of the cases, the onset was very abrupt and was marked by profound prostration. The patient would suddenly collapse while at his work. The pulse would become almost imperceptible and the surface of the body clammy and cold. In some of these cases, the temperature would be quite high, 103 or 104, and in two cases as high as 105½; while in others it would be subnormal. After getting the patient in bed and administering stimulants, these signs of collapse would rapidly disappear. Neither did these cases seem to run a more serious or more prolonged course than the others with the milder onset. In those with the severe onset the leukocyte count was usually 5000 to 7000. Leukopenia was very common following the illness.

The symptoms most characteristic of this disease were the following:

Coryza.—This was by far the commonest symptom, beginning early in the prodromal stage, and continuing through the course of the disease, even persisting after the patient was able to resume

his usual duties. The nasal secretion was very profuse and watery at first, but later tenacious in character.

Sore Throat.—With only few exceptions every case had a markedly injected throat, the soft palate, pillars and pharynx usually being involved. Frequently the uvula and soft palate were dotted with vesicles—in fact this was such a common finding that it could be called characteristic of the throat condition. In those patients with hypertrophied tonsils, these were usually found inflamed. As a rule, there was a decided discrepancy between the subjective symptom and the marked inflammatory change in the throat.

Myositis.—Practically every case had a certain amount of backache and legache. In some, the aching in the muscles was acute and was the most bitterly complained of symptom. At times, this was accompanied by a sciatica or other form of neuritis.

Headache.—This was usually complained of in the early course of the disease. It was commonly located in the frontal, temporal region, and caused the patient to complain of dizziness on moving.

Chill.—An actual chill was uncommon, but cold extremities and chilly sensations all over the body, was the rule.

Fever.—This was present in the majority of cases at the onset. It was characteristic for the temperature to be normal in the morning, but up again in the evening. In most cases the temperature would disappear after two or three days. The average temperature was 100° to 101°, but as stated before it occasionally rose very high, even to 105.5. The temperature depended a great deal upon the patient's keeping quietly in bed until the symptoms disappeared.

Pulse.—This varied between 80 and 100, but the slow pulse was the most characteristic.

Bronchitis.—This was a very frequent symptom. The cough was most often paroxysmal in character, especially at first. The sputum early was thin and frothy and usually contained small, white particles. In many cases this symptom subsided without any further development; in others, the bronchitis would persist and the sputum would become thick, yellowish, and purulent. The hemolytic streptococcus could usually be found in this type of sputum. As a rule, those cases ran the longest course which developed the most marked coryza and bronchitis. The examination of the lungs when bronchitis was present invariably showed fine, subcrepitant râles over the upper lobes. It was seldom that any other signs were present. Pleurisy was very uncommon.

Herpes.—Herpes about the nose and on the lip were present in a few cases, but were not the rule, as pointed out in the true influenza epidemic.

Delirium.—This was not noticed in any of the cases which

came under our observation. Neither were other nervous manifestations noticed to any extent.

The above symptoms were those which were commonly noted at the outset of this disease when the employees reported to the doctor's office.

Course of the Disease.—The average length of time, in 1000 cases, for the disease to run its course was five and three-fourth days. Some recovered in twenty-four to forty-eight hours, while in others the disease persisted for three to six weeks. The course of the disease was undoubtedly cut short by taking it in time and adopting active treatment at once. The most prolonged cases were those who persisted in working several days after the symptoms of the disease had manifested themselves. Likewise the course was prolonged by patients getting up and about as soon as they began to feel better, instead of remaining in bed a few days after the symptoms had subsided. Relapses were very common, especially among those who returned to work too soon. As a rule when a relapse did occur, the symptoms were much more severe than in the original attack.

Complications.—Pneumonia was by far the most frequent complication of this epidemic of 1915. Most of the deaths reported were due to pneumonia. In some cities the death rate from pneumonia increased four and five times, as compared with the year previous. In Chicago the number of pneumonia deaths for the week ending December 11, 1915, was 77; during the week ending December 18th, the number was 108; for the week that ended Christmas Day, the number was 205, while the corresponding week a year before the pneumonia deaths totaled only 73. In talking with numerous physicians and different Board of Health officials, it was agreed by all that these increased pneumonia deaths were the terminal results of this so-called influenza epidemic.

Pleurisy with effusion and empyema were reported by many doctors as a cause for the long continued absence of employees from work following an attack of this infection.

Various forms of neuritis, especially lumbago were common complications. In examining a great many of these patients after they had recovered from an attack of this disease, a number were found with rapid, irregular hearts and other signs of a distinct myocarditis. A few cases of otitis media both serous and purulent and of mastoiditis were reported. It was not uncommon to find many cases of gastro-intestinal disturbance, following an attack of this epidemic, and a few cases were seen of cholecystitis accompanied with marked jaundice. Relapses or recurring attacks of the disease were very common. The greatest number of these occurred from one to two days after the patient had recovered from his original attack and had returned to

work; but a number of secondary attacks occurred as long as two and three weeks after the patient had returned to work.

Many remote complications developed among the employees who had suffered from this epidemic infection, and, while the connection could not always be traced, yet we felt justified in holding this so-called influenza attack responsible.

Within a period varying from two to eight weeks after their return to work, four men developed cases of acute, suppurative mastitis without any history of trauma to the gland. In two of these streptococci were found and in two both streptococci and staphylococci.

Hand infections following slight injuries were more prevalent in January, February, and March following this epidemic than in any other equal period of my connection with this plant. Four cases of very slight scratches developed lymphangitis followed by large axillary abscesses. All four of these employees had suffered a short time before from the epidemic infection.

Five employees shortly after their return to work developed severe abdominal pains, rigidity and diffuse tenderness. The leukocyte count was below 14,000 in all of these. The cases resembled acute appendicitis. One was operated but the appendix was only slightly injected. These cases corresponded to the descriptions of abdominal complications which were prevalent during the epidemic and were described as acutely inflamed mesenteric glands.

Swollen glands of the neck were seen in several cases following the attack but only two of these suppurated.

One case of cellulitis of the abdominal wall and another of cellulitis of the thigh followed slight injuries to these parts in two men who had shortly before had the "grippe."

In March, 1916, eighteen cases of tuberculosis were found among the employees. All of these had suffered during the winter from the epidemic. Twelve of these cases had been examined during the year previous to the attack and no signs of tuberculosis had then been discovered. This bears out the experience of others that these acute respiratory infections frequently tend to light up latent tuberculous areas.

These remote complications demonstrate that the economic loss to industry from these increasing epidemics of streptococcic sore throat, streptococcic pneumonias, and streptococcic respiratory infections grafted on influenza or other acute infections continue for months after the acute epidemic has subsided.

Treatment.—The extensiveness of these epidemics, the greatly increased death rate, and the incalculable economic loss to the community and to practically all of the industrial concerns, has presented many problems, not only to the health department but to those

physicians engaged in industrial medical work. The greatest problem in the line of treatment is the prevention of the spread of such epidemics.

Various health departments have done invaluable work through their newspaper campaigns of educating the public concerning the importance of isolating every case of this disease and their warnings concerning the danger of sneezing, promiscuous kissing, the use of the common towel, and all other means by which the secretion of the affected individual infect his fellows. The source of greatest menace to the public and one which is practically uncontrollable by a health department is the early case who was not sick enough to remain at home the first two or three days of his attack, the light case who in spite of his symptoms is able to stick it out and remain at work every day, or the serious case who, as soon as he feels better mingles with the public before he ceases to be a menace as an infection carrier. More harm is done by these three classes than all the other cases put together, and in the future a great amount of education needs to be directed toward these groups. It behooves the entire medical profession to recognize the infectious nature of this disease and to use the same precautions toward it that we do toward diphtheria and scarlet fever.

The medical staffs of various large industries, and there are a number of such staffs now, found a task of great magnitude on their hands in combating this epidemic of 1915. They were forced to face two problems in this work: First, to prevent the spread of the epidemic among the employees; and second, to be sufficiently conservative in their efforts as not to cripple the business, especially as there was an excessive amount of work, due to the Christmas rush. As soon as we recognized that an epidemic was among us, our medical staff took steps to subtly re-enforce the rules which are always in force concerning sickness. We notified every manager, floor manager and division head to send every employee who showed signs of "catching cold" or other signs of this disease to the doctor's office at once. Likewise, no employee was allowed to go home on account of sickness without reporting to the doctor's office first, and no employee was allowed to return to work after being home on account of sickness without first securing a permit from the doctor's office. This gave the opportunity of examining all those who were sick and of sending those who showed signs of this disease home at once, and of keeping them away from the department until they had fully recovered. A number who had apparently recovered were allowed to return to work, but as stated elsewhere, relapses were not uncommon. No opportunity was neglected to instruct the individual employee in the various means of preventing the spread of this infection.

Two of our best methods of prevention were frequent airing out of the various departments and the formaldehyd fumigation of the departments overnight. The necessity of throwing open all the windows of the department for two or three hours in order to rid the room of the formaldehyd was undoubtedly one of the great benefits of the fumigation. Thus our efforts toward prevention were directed along four very definite lines: First, the ridding of the department of the affected individuals as rapidly as possible; second, educating the employees concerning their individual responsibility toward preventing the spread of the infection; third, the plentiful use of fresh air; fourth, the frequent fumigation.

Active Treatment.—We early recognized that a great many of the employees did not consider the sickness sufficiently serious to consult a physician, thus often needlessly prolonging their disability. We began therefore to ascertain from each sick employee the name of his family physician and insisted upon them calling him in as soon as they reached home. In a great many cases we called the family physician and made sure that he was on the job. Many had only a light attack of the disease and did not feel sufficiently sick to call in a physician, while others did not have family physicians. To these we frequently gave a prescription for aspirin, or sodium salicylate to be taken in ten grain doses every two hours. Likewise they were given a cathartic of castor oil or magnesium sulphate at once, and a gargle of Dobell's solution, and were then sent home and told to use the medicine as directed and stay in bed for at least two days. Our visiting nurse called on as many of these as possible and made sure that they were following out these directions. In this way many of these early cases were aborted and the employees were able to return to work within two or three days. By this careful supervision and with the aid of our visiting nurses, most of our patients received active treatment for this disease from its onset. In this way many of them were saved from serious complications and the length of their disability was greatly reduced.

Results.—While the death rate from pneumonia complicating the epidemic was increasing to 3 and 4 times the normal rate throughout the city, yet among the 1800 cases occurring among these employees there were only three deaths, all due to pneumonia.

Three other large concerns in Chicago reported an absentee rate of from 25 per cent. to 35 per cent. of their total working force during this epidemic. In this concern 12 per cent. of the employees were involved. One physician reported 8 per cent. of the employees he was responsible for as absent on account of influenza, while a neighboring concern had 40 per cent. of their employees infected.

One of the departments where the disease was very prevalent in

the author's experience had a number of employees absent for this cause during the first two weeks. We then began a thorough formaldehyd fumigation of this department every night with the result that this infection decreased materially within the next two weeks, and after that this department had the smallest number of cases compared with the other departments in this concern. The fumigation method was used quite extensively after the first month of the epidemic. Undoubtedly two sources of infection can be controlled by frequent cleaning and fumigation, namely, the material handled and the dust in the rooms.

Physicians in industry are in the best position to co-operate with the public health officials in controlling these epidemics in a community. They can discover many of the cases at their onset and start early, proper treatment. They can educate the employees as to the best means of preventing the disease and its spread from one individual to another. The entire field of industrial hygiene can be utilized to combat the epidemic in both the industries and in the community.

The above description of the streptococcic epidemic of 1915 and the methods employed then are applicable to the epidemics described to-day under the various titles of "Spanish influenza," influenza, epidemic of streptococcus pneumonia and empyema (Joseph Miller), epidemic streptococcal bronchopneumonia (W. G. MacCallum), hemolytic streptococcus causing severe infections (H. L. Alexander), and described by Rufus Cole under prevention of pneumonia.

Most of these later epidemics have been reported from army camps where the crowding together of the soldiers has facilitated their spread. But the same epidemics are weakening our man power in industry and causing an ever increasing loss. Every year it is becoming more and more evident that the physician in industry must become an expert epidemiologist if he is to render the greatest services.

While authorities differ as to the part played by the influenza bacillus in these epidemics, yet most investigators are convinced that the hemolytic streptococcus and the various types of the pneumococcus were the most dangerous agencies in the above described epidemic.

In order to adequately meet the situation it must be determined to what extent the influenza organism lowers the patient's resistance and makes possible the invasion of these streptococcus organisms. The profession must become familiar with the exact nature of these hemolytic streptococci and pneumococci which are so prevalent in all of these epidemics. There are many unknown factors which must be cleared up before our preventive measures can be fully perfected.

It is just as necessary therefore for every industrial dispensary to have a well equipped laboratory and a special laboratory worker to study this disease among the employees as it is to have a similar arrangement in the army hospitals. More attention must be paid to the scientific field of investigation of diseases among employees. The savings to industry by such efforts would pay a hundred-fold dividends.

Until we know the different strains of the organisms causing these epidemics our best preventive measure, namely vaccination, cannot be perfected. Nevertheless good reports are constantly being received which point to the fact that vaccination against pneumonia will soon be perfected. Lister, in South America, has reported very decided results from vaccination against pneumonia among the natives working in the mines, among whom pneumonia has always been very fatal.

The isolation of these cases in infectious hospitals, keeping them segregated from other non-infected patients, the cubicle system, and other methods of prevention after the disease is established are giving excellent results.

Our greatest problem both in industry and in the army is to prevent the spread of the disease. *Searching out the cases instead of waiting for them to seek the doctor, instituting early isolation and treatment, educating each individual in methods of prevention and his responsibility toward others, and re-enforcing the methods of sanitation in both the working places and the homes, are the essential elements for the control of epidemics.*

Searching Out the Cases.—1. See every sick employee, take his temperature and pulse, examine his throat and in other ways ascertain if his sickness is due to this disease.

2. Instruct nurses and lay assistants among the employees (foremen, assistant foremen and intelligent employees) to mingle with the working force and pick out anyone who shows prodromal symptoms. Send these to the doctors for examination.

Early Isolation and Treatment.—1. Immediately send every employee with fever of 99^{2}° or with a "cold," sore throat or other prodromal symptoms home. It is better to have ten such employees away for two days each than that three of their number should develop a severe infection causing two weeks' loss of time for each. These mild cases often are the sources of infection for other employees who may lose many days from work.

2. Proper, early treatment given to those people with the prodromal symptoms will abort the more serious infections with their subsequent complications in the majority of cases.

3. Rest in bed, free catharsis, and light, nourishing food are the most essential factors in early treatment. Each case should be supervised so that a doctor is called at the first indication.

4. Protection of those caring for these cases by masks, gowns, rubber gloves and disinfectants is essential.

Education and Individual Prevention.—1. By individual conferences, talks with groups of employees, bulletin board signs, and large placards and bulletins printed in the different languages, the employees can be educated in all matters of prevention and their responsibility toward fellow employees.

2. The chief points to emphasize are:

(*a*) Reporting to the doctor at once when prodromal symptoms are noted. (Describe these.)

(*b*) Sources of spread of the disease, namely, by careless sneezing, coughing, blowing of the nose, breathing or talking in another's face, using common drinking cups and towels, placing things in the mouth or handling articles which others will place in their mouths, carelessly shaking the handkerchief about, promiscuous spitting and numerous other ways in which the infected employee can become a menace to others.

(*c*) Avoiding crowded rooms, theatres, street cars, when possible, and other places where people tend to congregate.

(*d*) Instruct in home sanitation and the means of contaminating or being contaminated by other members of the family.

(*e*) Preach good *food*, plenty of *fresh air*, and sufficient *rest* at all times.

(*f*) Avoid booze, keep bowels regular and establish other regular habits.

(*g*) Report every suspicious case to the doctors just as for diphtheria or small-pox.

Reinforcing Sanitation Methods.—1. By preventing overcrowding.

2. By adequate ventilation especially frequent airing out of the rooms.

3. By cleanliness about the plant; sweeping only at night and then wet sweeping.

4. By some adequate form of fumigation.

5. By rest periods and other means of avoiding fatigue.

6. By co-operating with the Public Health officials.

This problem of the acute respiratory infections in the epidemic form has been dealt with at length because of its insidious nature, the great damage which it can do among employees, and because the methods of combating it also apply to all other types of epidemics.

Diphtheria

Diphtheria is another disease which requires constant alertness on the part of the physician in industry to prevent its becoming epidemic. Fortunately it can usually be diagnosed early by adequate

laboratory methods. The discovery of a few cases of this disease by the plant laboratory is always one of the strongest arguments in favor of this necessary adjunct to a well equipped doctor's office.

Every employee reporting with a suspicious throat or with a very marked tonsillitis should be sent to the laboratory for an immediate smear examination and culture. The latter can be sent to the City Health Department if facilities are lacking for incubation. All these suspicious cases should be sent home at once. When the smear shows diphtheria bacilli, the same should be reported to the family physician direct so that he can administer the antitoxin early. Just as soon as the report is obtained from the culture it should also be reported if positive. All of these cases must be reported to the Health Department of the community at once so that proper quarantine measures can be provided.

The department where the case developed must be closely watched for any other signs of an outbreak. All employees who remain at home on account of sickness during the next ten days should be visited by the nurse and the cause of the absence ascertained. The foreman and assistant foreman should always be advised of the condition and their co-operation secured for a closer observance of the existing rules if this is possible. Whenever a case of diphtheria develops at the plant the department should be thoroughly fumigated as soon as the employees leave at night. The watchman can throw open the windows about 4 A.M. and air out the room before the force arrives in the morning.

These rules have been carefully enforced by the author for several years. Many cases of diphtheria have been found among the employees but seldom has it spread from one employee to another. The nearest approach to an epidemic was when seven girls in one department developed the disease at the same time. Two of these girls who roomed together failed to report for work because they were sick. The nurse called and found that no doctor had been consulted although both girls had severe sore throats. Cultures were made by the nurse and brought to the laboratory. The next morning these were found to be positive for diphtheria. The nurse immediately called and had the girls send for their physician who took charge. The health department was also notified. That day two other girls from this same department reported to the doctor's office with suspicious throats and cultures proved positive in both cases. The department was fumigated that night. Every girl who was absent during the next ten days was visited by a nurse and the three additional cases were discovered in this way. Without the help of the laboratory I am convinced that a real epidemic of diphtheria would have developed in this department where 200 girls were employed.

Time and again the public health department has been put in touch with these sources of contagion and has been able to stamp out a threatened epidemic in the community.

The Acute Exanthemata

Sporadic cases of measles, scarlet fever, mumps, chicken-pox, and other contagious diseases are more or less prevalent in all communities. These diseases appear at intervals among the employees of any large industry. Constant watchfulness is necessary to prevent their becoming epidemic among those employees who are working in close contact with one another. This watchfulness must be increased whenever these diseases appear in epidemic proportions in the community.

In order to combat these contagious diseases among employees the physician must have accurate knowledge of every sign and symptom, must be able to discover these in their earliest aspects, and must isolate all such cases at once. Following this the constant supervision of the other employees from that department and the fumigation of the department must be carried out as described for diphtheria. The visiting nurse is the greatest ally the physician has in all of these cases. Reports from the city health departments can be obtained whenever a contagious disease is present in the homes of any of the employees, thus enabling the physician to give individual supervision to such workmen.

In a large industry employing 15,000 people in Chicago, the following contagious cases were found during a period of six months. Mumps alone appeared in epidemic form and was under control after one month.

Disease	Number of cases
Mumps	22
5 cases in one department	
4 cases in one department	
6 cases in three departments	
7 cases in seven departments	
Scarlet Fever	9
2 cases in one department	
7 cases in seven departments	
Diphtheria	6
2 cases in one department	
2 cases in one department	
2 cases in two departments	
Measles	4
4 cases in four departments	
Erysipelas	2
2 cases in two departments	
Chicken-pox	1
Total	44

The small number of these cases occurring in the same department proves the advantage of this system of supervision. Every one of these employees were potential epidemic breeders.

Small-pox.—Most large industries require a certificate of vaccination from every new employee. Some concerns vaccinate free of charge all applicants who fail to show a good scar or who have not been vaccinated within the last seven years. This latter plan was followed for three years in the concern with which the author was connected. It was seldom that a new employee refused to be vaccinated. Any arms that became quite sore or infected were cared for free of charge the same as an accident case, the employee receiving full wages during his absence. This took much valuable time from the other medical work and was finally abandoned. Only those cases who on examination could not show a good vaccination scar were required to be vaccinated before being employed.

Twice during a period of nine years the entire working force has been vaccinated because of a case of small-pox developing in an employee while at work. Two doctors with four nurses as assistants were able to vaccinate 3000 employees a day, thus protecting the entire force by this method within a period of five days. In both instances the president and general manager of this concern set the example by being vaccinated first.

Supervision of the working force, co-operation with the city health department and vaccination are the preventive measures needed against small-pox.

Typhoid Fever.—This disease has often proven very disastrous to working forces. The chief methods of prevention consist of proper sanitation in the working force and in the community. Typhoid was very prevalent among the lumbermen of the Northwest. The industrial surgeons of Washington inaugurated an educational campaign against it which aimed at the employers and employees alike. By improving the privies and providing other means for sewage disposal and by educating the people as to means of prevention, they were able to reduce typhoid fever to a wonderful extent. The sanitation measures necessary to prevent this disease are so well known that details are not necessary here. Every physician in industry should make it his business to clean up all conditions in the plant or in the community which predispose to this disease (see Figs. 23 and 24).

The experiences in the army of preventing typhoid fever by inoculation have proven how efficacious this method is. Only one death in almost 2,000,000 inoculations has been attributed to this measure. So far there has been less than 100 cases of typhoid fever in the army since this war began. Mark the con-

trast in the army during the Spanish-American War when at times 90 per cent. of the cases in the hospitals were due to this disease.

Undoubtedly our civilian population will adopt this form of prevention as universally as they have vaccination against small-pox. The physicians in industry should provide inoculations against typhoid for all employees who voluntarily seek this form of prevention.

Several things are very essential in dealing with contagious diseases among the employees. Common sense methods must be used which will yield proper protection for the entire working force and yet will not cripple or stop the production of the plant entirely. For example, when a case of scarlet fever is found in a department it would afford a greater measure of safety perhaps to at once dismiss the rest of the force and fumigate the department at once. Such a procedure would be disastrous to business and fumigation at night with the other precautionary measures described have proven adequate. Every effort must also be made to avoid panics among the other employees. A cool, calm, matter of fact attitude toward the situation will allay fears among the timid ones whereas excitement, blustering or a display of haste will often start a panic. I have taken smears from the throat of every employee in a department looking for diphtheria carriers without creating the least fear among them. Careful explanations of your reasons for doing thus and so will always result in cooperation from the working force.

The doctor's office should be provided with a room where these contagious cases can be isolated while awaiting transportation home or to the hospital. They should never be allowed to go home on the street car or in public conveyances. The writer made arrangements with a taxicab company to take such cases home and then have the cab return for fumigation. It is our duty to make sure that all public cabs used by contagious cases are properly fumigated before accepting other passengers. Often the public health departments will furnish free transportation in an ambulance for all contagious cases.

No greater opportunity for developing the most scientific epidemiological methods can be found than here in the practice of Industrial Medicine. All the involved economic and social problems are here combined with our medical efforts.

Venereal Diseases

The combating of venereal disease among employees has been woefully neglected by the majority of physicians in industry. This can be accounted for in two ways: (1) The indifferent attitude which

the medical profession has always assumed toward the prevention of these diseases; (2) the fact that most concerns have discharged the employee who was discovered with venereal disease.

The war has awakened the profession and the general public to the extensiveness and the ravages of both gonorrhea and syphilis throughout the army and the civil population. It is to be expected that a more active, nationwide fight against these conditions will be the result. The plant physicians are in the best position to take a very prominent part in such an effort.

Figures obtained from many industrial physicians show that the number of venereal cases found among the employees examined varies from 2 to 10 per cent. This is exceedingly low as compared with other diseases found and as compared with the statistics given showing the great prevalence of these diseases in the army and in many of our large cities. The explanation is found in the fact that the infected employee very carefully concealed his trouble fearing the loss of his job if it became known.

In 1915 I began a systematic search for these cases. The management, through their medical department, let it become known that no man would lose his job if he reported to the doctor's office when he was diseased and especially if he followed the directions given him regarding the protection of others. As a result the number of men found with venereal diseases rapidly increased. Arrangements were made to treat all these cases at the night clinic of Industrial Medicine and Surgery at Rush Medical College. Salvarsan was administered to the syphilitic cases for the cost of the drug. In a few cases loans from the concern were made to buy this drug due to the fact that it became very expensive during the early years of the war. All employees with syphilis in its communicable stage were kept away from work until the open lesion was healed. Careful instructions were given to all types of cases regarding the dangers of contaminating others. The acute gonorrheas were given light work always until it was safe for them to return to heavy occupations.

Prevention propaganda was spread by personal talks whenever possible. I am sorry to admit that a general campaign of prevention against this condition, which certainly lowered the efficiency of the working force and caused much loss of time from work, was not undertaken.

It is absolutely necessary for the medical staffs of industry to at once recognize that the prevention of venereal diseases is as logical a part of their work as the prevention of accidents and of other diseases.

To accomplish this they should immediately adopt the following procedures:

1. Spread the propaganda concerning the prevention of venereal

diseases throughout the entire force, by posters printed in different languages and placed in every toilet; by individual talks, lectures to the men and stereopticon shows; by women physicians giving lectures to the girl employees. The following bulletin taken from the State Board of Health of Michigan and adapted to industrial needs by a few changes will illustrate the type of poster to use:

VENEREAL DISEASES

"Gonorrhea (or clap) is a germ disease. It causes: (1) Ill health and loss of time and money to the man infected. (2) Many innocent wives to become invalids for life. (3) A large proportion of surgical operations upon women. (4) Many childless marriages. (5) Much of the blindness of children. Gonorrhea can be cured *but often is not cured* when the man thinks himself cured. The germs of gonorrhea often remain hidden in the body ready to cause serious trouble, even when the symptoms of disease have apparently ceased under treatment.

"Syphilis (or pox) is often a germ disease. If not cured, syphilis may be transmitted to wives and children many years after infection. It may cause insanity, locomotor ataxia, or total paralysis. Syphilis can be cured, but only by long and thorough medical treatment.

"Prevention.—(1) Keep away from prostitutes, both professional and non-professional. (2) Sexual intercourse is not necessary to physical and mental health. (3) Antiseptic washes and other preventive measures are not always reliable.

"Beware of advertising specialists, who claim to cure 'nervous debility,' and 'private diseases of men.' The use of patent venereal medicines may lead to very serious consequences. Night emissions, or 'wet dreams,' if not too frequent are natural in men. They are not a sign of 'lost manhood.' Advertising specialists get large sums of money for treating 'diseases' which do not exist.

"What to Do.—(1) If you have exposed yourself, go at once to a competent physician. (2) If you contract venereal disease protect yourself and protect others—report at once to the doctor's office. The plant physician will see that you receive proper treatment. You will not lose your job and the trouble will be held confidential between you and the doctor. (3) Do not worry. Lead a vigorous, healthful life and forget about sex matters. (4) Be consistent and adopt the same standard of sexual conduct for yourself that you expect of women."

2. Arrange for the proper treatment of every venereal case and carefully supervise until cured.

3. Instruct each case in proper methods of protection of his fellow workmen.

4. Report every case to the Department of Health and co-operate with them in tracing down the source of the infection and in freeing the community of that prostitute.

5. Subtly ascertain if the infected employee has infected other women and report these to proper authorities.

6. Work for the adoption by all state governments of the following measures suggested by the Council of National Defense, Committee for Civilian Co-operation in Combating Venereal Disease.

"(*a*) Establishment of a Bureau or Division of Venereal Diseases of the Department of Health with an adequate personnel, and with provisions for free laboratory examinations (including the Wassermann test) and for the distribution of arsphenamine (salvarsan) under proper regulations free or at cost.

"(*b*) Provision for the suppression of prostitution, for the examination of arrested prostitutes and for the isolation and treatment in public institutions of those infected.

"(*c*) Provision for the commitment to institutions of uninfected prostitutes for industrial training and for the commitment of all feeble-minded prostitutes to custodial care.

"(*d*) Provision for the reporting of syphilis and gonococcus infection by physicians (according to regulations which protect both the patient and the public), and for the compulsory and systematic treatment of all infected persons when necessary and for the protection of the public health.

"(*e*) Establishment of venereal disease clinics and advisory stations.

"(*f*) Provision for the posting of venereal disease placards in men's lavatories of barber shops, Y. M. C. A.'s, hotels, railroad stations, factories, stores and similar places and for the distribution of pamphlets of information.

"(*g*) Provisions for lectures (with or without stereopticon) and for the display of educational exhibits under the auspices of the board of health, the council of defense or other agency, before business men's organizations, employed men, women, boys, and girls, church organizations, women's clubs and other groups.

"(*h*) Provisions for the elimination of advertising specialists in men's diseases and of the sale of venereal disease nostrums."

Industrial surgeons have taken the lead in almost every branch of preventive medicine and preventive surgery. The prevention of venereal diseases alone has been neglected. Laying all other motives aside, from an economic standpoint we can no longer afford to neglect this work.

CHAPTER XIX

HEALTH HAZARDS IN OCCUPATIONS

The physician responsible for the human maintenance in an industry must become expert in the detection and prevention of every health hazard connected with the various occupations represented therein.

Volumes have been written on this subject of occupational diseases. In Europe numerous laws have been enacted for the prevention of work diseases and of recent years have been vigorously enforced. In our own country the various states are beginning to awaken to their responsibility toward the millions of people employed in hazardous occupations and each year sees new and better legislation on this subject. Not, however, until clear and adequate laws are passed and rigidly enforced by every state and by the Federal Government will the prevention of these conditions be perfected. Hand in hand with the legal measures there must be a nationwide educational campaign instituted.

Physicians practicing industrial medicine must know the classical occupational diseases and must be constantly on the lookout for hazards in other occupations not heretofore considered harmful to employees. These doctors must become the pioneer crusaders in this, one of the greatest health movements thus far undertaken in our country.

Until within the last ten years the subject of occupational diseases has been woefully neglected by the majority of the medical profession. As a result of the work of a few physicians in industry the subject has been more and more forcibly presented with the end that at least six medical schools of the country now have courses for the students covering many of these diseases.

Dr. John D. Ellis, one of the pioneer teachers in Industrial Medicine at Rush Medical College, University of Chicago, has written the following article on Health Hazards in Occupations for the author. This résumé and the references to other authors should give the student an excellent insight into the wide range of diseases which can result from occupations and the various methods employed thus far for their prevention.

For this most helpful contribution the author desires once more to express his gratitude to his co-laborer, Dr. John D. Ellis.

DUST AS A HEALTH HAZARD

The number of men who are unfitted for work at their trades or who are incapacitated after a few years of work because of conditions resulting from working at dusty occupations far exceeds those incapacitated by all other health hazards. Dusty trades, therefore, claim consideration of first magnitude by the industrial physician. The health hazard resulting from dusty occupations is difficult to estimate since injurious effects are not always due to dust itself, but many times to bacteria gaining entrance to the system with the dust, or to infections made possible through lowering of the general or local resistance caused by the effect of dust on the workmen.

Dust, both of the invisible and visible type, is much more dense in the air in factories and workshops than in any other place in which human beings are crowded together. The coarser dusts are of course visible, but the finely pulverized particles of matter constituting invisible dust may be far more harmful if composed of irritating mechanical matter like silicate spicules or poisonous material such as soluble lead salts.

Some of the commonest industries in which the worker inhales large amounts of dust are the textile mills, especially cotton mills, in the carding and preparing rooms and manufacturing of shoddy, in handling of rags and other waste products of such mills, manufacturing of clothing and furs, renovating clothing, rags and mattresses, in flour and corn mills, quarrying and grinding of stone and the manufacture of cement, the smelting, buffing and refining of metals, and in the manufacture of carborundum, graphite, carbide and lime.

Rambousek[1] quotes Hesse whose table of amounts of dust inhaled by men working ten hours a day in certain dusty industries is as follows:

Horsehair works	0.05 grams per day;	15 grams per year (300 days)
Saw mills	0.09 grams per day;	27 grams per year
Wool mills	0.10 grams per day;	30 grams per year
Flour mills	0.12 grams per day;	36 grams per year
Iron foundries	0.14 grams per day;	42 grams per year
Snuff-tobacco workers	0.36 grams per day;	108 grams per year
Cement works	1.12 grams per day;	336 grams per year

Arens[2] determinations show that in cement works while not in operation there were 130 milligrams of dust per cubic meter; while during the operation of the plant there were 244 milligrams. In a felt shoe factory in operation he estimated there were 175 milligrams of dust per cubic meter of air; while Rogers found in skirt fac-

[1] Luftnerungreinigung und Ventilation, p. 103.
[2] Ibid.

tory and pearl button works 70 grams of dust per million liters of air and in a brass foundry 75.2 grams in the same volume of air.

Price[1] classifies dust as follows:

1. As to source:
   (*a*) Meta .
   (*b*) Mineral.
   (*c*) Vegetable.
   (*d*) Animal.
2. As to physical qualities:
   (*a*) Size.
   (*b*) Shape.
   Round or sharp edges.
3. As to chemical characteristics:
   (*a*) Organic or inorganic.
   (*b*) Soluble or insoluble.

Hoffman[2] classifies the source of dust in forty-two dusty industries, which of course does not include entire category, into the following groups:

Group 1.—*Exposure to metallic dust*

1. Grinders
2. Polishers
3. Tool and instrument makers
4. Jewelers
5. Gold leaf manufacture
6. Brass workers
7. Printers
8. Compositors
9. Pressmen
10. Engravers

Group 2.—*Exposure to mineral dust*

11. Stone workers
12. Marble workers
13. Glass blowers
14. Diamond cutters
15. Glass cutters
16. Potters
17. Cement workers
18. Plasterers
19. Paper hangers
20. Molders
21. Coremakers
22. Lithographers

Group 3.—*Exposure to vegetable fiber dust*

23. Cotton ginning
24. Cotton textile manufacture
25. Spinners
26. Weavers
27. Hosiery and knitting mills
28. Lace making
29. Flax and linen manufacture
30. Hemp and cordage manufacture
31. Manufacture of jute and jute goods
32. Paper manufacture
33. Cabinet makers
34. Wood turners and carvers

Group 4.—*Exposure to animal and mixed fiber dust*

35. Furriers and taxidermists
36. Hatters
37. Silk manufacture
38. Woolen and worsted manufacture
39. Carpet and rug manufacture
40. Shoddy manufacture
41. Rag industry
42. Upholstery and hair mattress makers

[1] Modern Factory, p. 395.

[2] United States Department of Labor, Bulletin 79, Mortality from Consumption in Dusty Trades.

Migerka[1] has made a thorough study of the shapes of dust particles and crystals, and other various injurious effects on the lining of the respiratory passages. He has collected microphotographs of the various dust particles.

Pathological Effects of Dust Inhalation.—Thompson[2] divided effects of dust on the human system into four types:

1. Mechanical obstruction of air passages. When the respiratory passages are in normal condition 1 per cent. of the dust is collected by the mucosa of the nose and throat before it reaches the larynx. Heim and Hebert[3] have made a study of the effect of plaster-of-Paris dust on rabbits and dogs and find that but few inhaled particles pass the vocal cords. Ghrörer[4] has shown more than 50 per cent. of lead dust inhalations is caught in the nasal passages while the mouth shows as high as 15 per cent. of the inhaled dust. Glogau[5] examined a number of workers in the jute mills and artificial flower and feather shops, finding that the nose was sometimes entirely filled with dust while in others only the turbinates and septum were affected.

2. Laceration of the delicate mucous epithelium. The effects of dust on the respiratory mucosa vary in degree from irritating reflexes such as sneezing and coughing, and increased lacrimation with subacute or chronic congestion of the mucous membrane through all degrees of catarrhal rhinitis, laryngitis and bronchitis, depending on what bacterial invaders appear in the field where the resistance of the tissues has been lowered by the constant assault by dust particles. In the lungs all stages of inflammation from mild bronchitis to chronic fibroid changes, pneumonia or phthisis can result. An anaphylactic reaction may result from inhalation of animal or plant dust and a part at least of the occupational asthmas are set up by this mechanism. Arnold,[6] has placed animals in atmosphere with some sandstone and ultramarine dust. All these types of dust reach the lung tissue easily and were found in the alveoli in the lung cells. There is a great divergency in the amount of harm done by the different particles of dust and this depends chiefly on the size, shape, character and mechanical action of the particles. It is generally considered that of the mechanical irritants, silica is the most injurious. All metal and mineral dusts are more harmful than organic vegetable or

[1] Monograph on the Kinds of Dust in Industrial Establishments from the Museum of Industrial Hygiene of Vienna.

[2] "Occupational Diseases," 1914, p. 42.

[3] Effects of Dust in Producing Disease of the Lungs. Lecture before the 17th International Congress of Medicine, London, 1913, p. 21.

[4] "Orientierende Versuche über Quantitative Staub-absorption durch den Menschem aus staubreicher Luft," Wurzburg, 1912, p. 22.

[5] Second Report of New York State Factory Commission, Vol. II, p. 537.

[6] Ascher: "Damer's handbuch Der Arbeiter Wohlfahrt," p. 410.

animal dust unless the latter carry infectious material with them. Dust of emery, glass, granite, etc., has a very curious mechanical action. Dr. Collis[1] concludes that inhalation of all types of dust mechanically diminishes the power of chest expansion through the production of interstitial lung changes and subsequent emphysema. This diminution is later accompanied by high blood pressure. He thinks vegetable dusts are usually liable to produce asthma. He considers that of the mineral dusts, calcium salts are the least injurious, and that those not containing free silica tend to produce irritation of the upper air passages and non-tuberculous lung diseases, whereas others containing free silica are more likely to produce tuberculosis.

3. Conveyance of soluble toxic material into the system. A well known example of this is the general effects of lead poison resulting from inhalation of lead dust in the painting and smelting trades.

4. Conveyance of germs in dust. Rambousek well says, "Where no dust is, there are no bacteria in the air."

THE CHIEF DUSTY TRADES

In Hoffman's[2] estimate based on United States Census, 1910, of 44,130,000 American workers of both sexes, probably 5,600,000 or about 12.5 per cent. are exposed to a greater or less degree to the health hazard due to working in an atmosphere containing a "relatively excessive presence" of atmospheric impurities coming under the classification of dust. He has adopted a division of dusty trades depending upon the composition of dust to which the worker is most exposed, *i.e.*, metal, mineral, vegetable fiber, animal and mixed fiber dust, and this makes as good a basis as any other for the discussion of some of the industrial processes involving the greatest health hazard due to dust.

NUMBER OF PERSONS ENGAGED IN OCCUPATIONS MORE OR LESS EXPOSING TO INJURIOUS DUSTS, GASES OR FUMES, IN THE UNITED STATES

(Ages 10 Years and Over)

Exposure to	Males	Females	Persons
Metallic dust	847,689	45,387	893,076
Mineral dust	756,459	16,424	772,883
Animal and mixed fiber dust	638,997	494,505	1,133,502
Vegetable fiber dust	152,999	22,467	175,466
General organic dust	500,936	214,325	715,171
Municipal dust	702,251	180	702,431
Gas exposure, fumes, etc.	1,196,191	19,954	1,216,145
Total	4,795,522	813,152	5,608,674

[1] A. L. Collis: "Effects of Dust Producing Lung Diseases."

[2] U. S. Department of Labor Bulletin 79.

Metallic dust exists to an injurious extent, in the atmosphere in almost every place in which metals are mined, smelted, refined, are manufactured into machinery or other finished products. Hoffman[1] cites as evidence of the deleterious effects of metallic dust inhalation in the metal trades, the fact that a relatively small number of persons of advanced years work in these industries; relatively high death rate prevails as compared with other trades, and more especially a high rate of death from diseases of the lungs. In foundries the greatest amount of dust is evolved during the casting and baking of cores, grinding cast objects and in the sand blasting processes. Grinding, polishing, and buffing metal cast objects or metal dies evolves both metallic dust and mineral dust from the grinding wheel. The most dangerous metallic dusts are those composed of brass, copper, and lead, since these act not only as mechanical irritants to the respiratory system and eyes but by absorption, in the case of lead at least, also to constitutional poisoning.

Mineral dust abounds as mentioned above wherever dry grinding occurs and also in all those trades connected with cutting, quarrying, or working stone of all sorts, grinding and cutting glass and diamonds, and also in the production of or employment in plaster, cement, pottery, carborundum, emery, graphite, carbide of calcium, and many other mineral products. It is impossible to estimate the relative importance of the parts played by the inhalation of dust of sulphuretted hydrogen carbon monoxid, and the ingestion of dust with the use of alcoholic beverages in the production of disease among miners and quarry men. Lindemann,[2] basing his figures on a trade organization numbering 357,321, shows that diseases of the digestive organs lead the list in the order of frequency with 11.1 per cent. per year, while diseases of the respiratory organs come second with frequency of 8.1 per cent. The ingestion of irritating dust may be responsible for a considerable part of this first class, while heat and humidity, abrupt changes in temperature and overwork may bear part of the responsibility for the second class.

As pointed out by Nieszytka,[3] the character of dust doubtless plays a more important rôle than the amount, for we are not otherwise able to explain the comparative innocuity of coal dust. Ogle[4] shows conclusively that the coal miners are the least affected by phthisis and lung diseases of any class engaged in dusty occupations. As pointed

[1] U. S. Department of Labor Bulletin 79.

[2] Disease and Accidents of Miners and Tunnel Workers in U. S. 15th Int. Cong. on Hygiene., Vol. III, Part II, Washington, D. C., 1913.

[3] Nieszytka: Viertaljahrscht. f. Gericht, Medizin, etc., 1912, Vol. 43, Suppl. Heft. 1 and 2, p. 143.

[4] Forty-fifth Annual Report of the Registrar General, England.

out by Collis[1] the death rate from tuberculosis among miners is only high under exceptional conditions. In rock drilling, particularly siliceous rock, the danger of this infection is especially high, as it is also among those working in quartz rock. This is because of especially harmful characteristics of the sharp and pointed edged crystals of the dust evolved from working in these minerals. The harmful characteristics of the dust from these minerals is startlingly shown in the statistics of the mortality in the region around Butte, Montana, and the Joplin District, Missouri, compiled by Lanza and Higgins.[2]

Most conspicuous among the industries which are hazardous because of the production of vegetable dust are those dealing with the production of textiles especially the ones in which hemp, flax and jute are handled.[3] In the carding, ginning, and preparation of cotton for cloth manufacture, an especially revolting aspect of the dust hazard is to be found in the customary employment of large numbers of women and children which prevails under the most distressing conditions in those southern states in which factory inspection is most lax and opposition to the passage of proper statutes for the regulation of the minimum age of employment and hours of labor for these is most stubborn. Even in the best regulated mills the work of the employee involves constant confinement in a dusty atmosphere. In the weave rooms and in ring-spinning rooms there is no method of alleviating the dust hazard except that of general ventilation exhaust apparatus not being feasible.[4] In the card stripping process, recently invented machines, now in use in many mills in New England and to some extent in the southern states, replace hand labor thus reducing number exposed.

The general processes involved in the manufacture of woolen goods carry the same health hazards as those of the cotton industry; sorting, carding, combing, spinning and weaving being the most dusty. Occasional cases of anthrax infection result from this industry. Hoffman's[5] statistics based on 155 deaths among carpet and rag makers show 23.9 per cent. were due to consumption and 16.9 due to other diseases in the respiratory tract. In the flax and linen industries, the health hazard due to dust is greater than in the woolen mills. The "heckling" process, being the most dusty, results in so-called "mill fever," to which our attention is called by Oliver.[6]

The death rate from tuberculosis in Belfast[7] with 30,000 of its

[1] Transactions International Congress of Medicine, London, 1913.

[2] Technical Paper No. 105, U. S. Bureau of Mines, 1915.

[3] Bulletin, U. S. Dept. of Labor, Bureau of Labor Statistics No. 127.

[4] Harrington-Richardson: "Practical Hygiene," p. 650.

[5] Bulletin Bureau of Labor No. 79, 1908.

[6] Oliver: "Diseases of Occupation," London, 1908.

[7] Ferris, G. H.: Journal of State Medicine, March, 1895.

population engaged in the linen industry was 4.1 per cent. per 1000 as compared with 1.4 per cent. for the whole of England and Wales and 2.1 per cent. for Ireland. In the manufacture of cordage, twine, jute including gunny cloth of which jute is the principal material, crash toweling, linen thread, nets and skeins, the work is now largely done by machinery except the preliminary opening of the baled material and feeding it into softening machines which is very dusty.

The dangerous dusts arising in the manufacture of dyes, especially coal tar dyes and those emanating from such mordants as arsenite of sodium which are used before the application of coal tar, and those from the lead salts used in calico printing and yarn dyeing are becoming less of a hazard because of the modern regulations covering their use. Clayton[1] found dust arising from lead and the chromic acid salts of lead still prevalent causes for poisoning in Great Britain in 1906.

The most drastic preventive measures against poisoning from dust produced in dye works, should be in effect in every state. The principal safeguards are the mechanical suction ventilation by fans of all parts of the dye processes from which any dust arises; the changing of clothing at the completion of each day's work; special lockers for street clothing to prevent dust and contamination; compulsory washing of the hands and face before meals and facilities for eating meals in rooms entirely separated from the industry; and the use of respirators in especially dusty places. Impervious oily applications to the skin are also indicated in some parts of the industry.

Careful study of the ill effects of the dust arising in the boot and shoe industry has been made by J. Beatty,[2] Medical Officer of Health of Northampton, England, where he found the death rate from tuberculosis among operatives in this industry to be 2.59 per 1000 as compared with the normal average of 2.08 per cent. for the whole population. F. L. Hoffman[3] in the study of the causes of death in the city of Brockton, Mass., found 25 per cent. of the deaths among shoemakers to be due to pulmonary tuberculosis and 11.4 per cent. to other lung diseases. Among the various processes in this industry, heel polishing and bottom sanding probably have the greatest dust hazard.

The high percentage of pulmonary tuberculosis among tailors and garment workers as instanced strikingly in many investigations and typically in that of Epstein,[4] who found 43.7 per cent. of the deaths among tailors to be caused by pulmonary tuberculosis, is of course by no means entirely due to exposure to dust. Overworking, over-

[1] Clayton: Brit. Med. Journ., 1906, Vol. I, p. 310.

[2] Ibid.

[3] Hoffman, F. L.: Bulletin Bureau of Labor, No. 82, May, 1909.

[4] Epstein: "Weyl's Handbuch d. Arbeiterkrankh.," Jena, 1908, p. 310.

crowding, underfeeding and poor ventilation, as well as filthy home conditions, are all factors of importance in its production.

Occupations concerned with the sorting of linen, wollen and cotton rags, and the operation of machines for shredding rags in the production of shoddy are very dusty ones. These processes are being more and more handled by machinery. Many infectious diseases from contaminated cloth can be spread in such occupations, among which small pox, anthrax, scarlet fever, tuberculosis and diphtheria have most often been recognized as resulting from "occupational exposure." Disinfection of the rags before shredding would prevent these, but chronic affections of the air passages from the constant inhalation of this organic dust can only be eliminated by proper ventilation. When rags are made into wall paper, danger from inhalation of bleaching chemicals enters as another hazardous factor. Furthermore, in the production of wall paper, many of the dyes contain arsenic or lead pigments which give rise to poisonous dust. Men employed in wall paper works should be examined at definite periods the same as any other men engaged in handling poisonous chemicals.

The amount and character of the dust evolved in wood working industries depends upon the character of the wood used. Dust particles from hard wood are finer, sharper and more irritating to the respiratory passages than from soft wood. Among those which produce a toxic or especially irritating dust are (1) "sequoia wood,"[1] (2) "cocobola wood,"[2] and (3) "sabion wood,"[3] which produces catarrhal symptoms, the Japanese hard wood "Togayasa," satin wood, blue gum, Indian rosewood, African boxwood, teak, and many more exotic hard colored woods of oriental origin.

Sommerfield[4] estimates the mortality rate among wood workers in Prussia as 6.6 per 1000, while Roth[5] estimates that 61.7 per cent. of all deaths among wood turners in Berlin between 1890 and 1897 were caused by phthisis.

Splitting and sorting rattan in chair factories, whip and walking stick manufacture, and furniture repair work, all carry a high health risk on account of the dust hazard in most workshops.

In threshing grain, storing and sorting it in elevators, flour milling, and baking, machinery is replacing the hand work and "millers' asthma" and tuberculosis, once prevalent in some of these trades, are consequently diminishing.

Much discussion has arisen over the supposed health hazards

[1] Oliver: "Dangerous Trades."

[2] Neisser: Internat. Ubersicht über Gewerbehygiene, Berlin, 1907.

[3] Nestler: "Prometheus," Berlin, 1913.

[4] "Handbuch der Gewerberkrankbeiten," Berlin, 1909.

[5] "Gewerbehygiene," Leipzig, 1907.

in the manufacture of cigars and cigarettes, and other forms of tobacco, and the U. S. Census Bureau among twenty-three occupations tabulated, places the rate of death from tuberculosis in this industry second only to that for marble and stone workers. Typical amblyopia such as is produced by nicotin is reported quite frequently among tobacco workers who do not use tobacco in any form.[1] These intoxications may be due quite probably to ingestion of tobacco or tobacco juices and possibly to absorption of nicotin through the skin as well as to the inhalation of tobacco dust.

INDUSTRIAL POISONS, OCCUPATIONAL INTOXICATIONS, GASES AND FUMES

Intoxications, poisonings or illnesses resulting directly from the deleterious action of materials used in the industries upon the body are variously defined for legislative, administrative and medicolegal purposes. Rambousek,[2] omitting industrial infections, defines substantially an industrial poisoning as one produced or somehow occasioned in industrial occupation and which is brought about inadvertently and consequently against the will of the person poisoned. Kober[3] defines diseases of occupation as injuries and disturbances of health contracted in industrial pursuits, and other vocations in life, as a result of exposure to toxic agents, infectious organisms, or other conditions inimical to health. This is an admirable definition since it includes a recognition of such factors as fatigue, epidemics from crowding, speed of work, over-specialization, prolonged periods of labor, faulty ventilation, and all others the close relation of which with the more specific causes of occupational diseases is often unrecognized. Industrial poisons are, from a medicolegal viewpoint, well defined by Dr. R. Fischer and this definition is approved by the advisory council of hygiene of the International Association of Labor Protection. "Industrial poisons are, in general," he says, "those raw materials and products, by-products, and waste products which in their extraction, manufacture, and use in industrial processes may, notwithstanding the exercise of ordinary precaution, find entrance into the body in such quantities as to endanger, by their chemical action, the health of workmen employed." Dr. Fischer has also revised the list of industrial poisons elaborated in 1908 by Prof. Thomas Sommerfield, Sir Thomas Oliver, and Prof. Felix Putzey. This has been improved and edited by the International Association of Labor Legislation and furnishes the most trustworthy and authoritative list available

[1] Galezowski: "Des Ambly op. et Amauroses toxigues," 1897. DeSchweinitz: "The Toxic Amblyopias, Etc.," 1896.

[2] "Industrial Poisoning," p. 159.

[3] Kober and Hanson: "Diseases of Occupation and Vocational Hygiene," p. 417.

at present. A translation published by the Bureau of Labor in Bulletin No. 100, and also by Kober and Hanson, is reproduced at the end of this chapter. The diseases here listed are classified with reference to their chemical causes, and fifty-four poisons are dealt with.

By a simple method of classification, now classical, suggested by Rambousek,[1] industrial poisons are divided into:

1. Poisons which act superficially, *i.e.*, which cause in the organs they touch, gross anatomical lesions (irritation, corrosion, etc.), the so-called contact effect. To this class belong irritant and corrosive poisons.

2. Blood poisons, *i.e.*, poisons which are absorbed by the blood and change it. This change can affect either the blood coloring matter which combines with certain poisons to form chemical compounds, or the red blood corpuscles themselves can be altered or destroyed by poisons having hemolytic or agglutinating actions.

3. Poisons with definite internal action, the so-called remote or specific effect. To this class belong the poisons which, after being absorbed into the system act upon particular organs or tissues in a specific manner (nerve poisons, heart poisons, etc.).

It is indeed possible for one poison to display two or even all three of these modes of action. Industrial poisons can be absorbed (1) as solid substances; (2) as liquids; and (3) as gases. Of the effects and dangers the absorption of poisonous substances in the form of dust we have already spoken. Industrial poisons which contaminate the air of the factory in the form of gases or dust are inhaled, or swallowed and absorbed through the alimentary system, or both. As a rule only liquid poisons enter the body through the skin.

Often repeated or continuous absorption of small quantities of poison produces slowly developing symptoms, but, as in lead poison, acute symptoms may develop after long exposure to the deleterious effects of small quantities of the toxic material. Acute industrial poison sometimes develops so suddenly that unconsciousness may supervene before the affected workman can withdraw himself from the influence of the poisonous agent as may be the case in carbon monoxid or mineral acid fumes poisoning. The effects of various poisons vary in severity and acuity from fatal attacks of acute chlorin or benzine poisoning, to the chronic intoxications from lead, mercury, arsenic, phosphorus, etc.

It must be remembered that an important rôle in the production of an occupational poisoning in any particular case is played by the factors of dosage per unit of body weight, rapidity of absorption, and such predisposing causes as individual susceptibility, acclimatiza-

[1] "Industrial Poisoning," p. 158.

tion or tolerance to the particular poison, low state of vitality, previous illness, bronchial or gastric affections, wounds and abrasions of the skin and alcoholism as well as the functional state of the organs through which toxic substances are eliminated from the body, *i.e.*, the intestines, lungs, liver, kidneys, and skin. The possibility of intoxication by any particular poison presupposes its solubility by the "body juices."

Laws requring the reporting of cases of occupational diseases and industrial poisoning in the industries have been so recently enacted, and in so few states, the detection of such cases in factories is so infrequent where an especially trained physician is not employed for the purpose, and periodical physical examinations of workmen exposed to these hazards so rarely established, that in America it is impossible even to guess at the extent of these diseases. In 1910 the First National Conference on Industrial Diseases[1] roughly estimated that there were at least 13,400,000 cases of occupational diseases in this country. These figures were based on the number of cases reported in industries in continental Europe as compared with the number of men employed in similar industries here, but without the possibility of allowance for a comparison of the preventive measures employed in Europe and America.

Aside from such rough estimates there have been, however, occasional careful pieces of work done upon the number of cases of certain occupational diseases in this country in very limited fields, as for instance, the study by Dr. Andrews[2] in 1910 of the phosphorous poisoning occurring in fifteen match factories in which 65 per cent. of the employees were exposed to the dangers of such poisoning with eighty-two cases of serious poisoning found in three factories alone; and the work of Drs. Alice Hamilton and Andrews on the prevalence of lead poisoning in certain trades, done under the authority of the United States Department of Labor and the Illinois Commission on Occupational Diseases; and following this the investigation of occupational disease in the various industries by various workers found in the Bulletins of the U. S. Department of Labor, Bureau of Labor Statistics, Nos. 95, 104, 120, 141, 165, 166.

In the scope of this chapter a comprehensive description of all the substances which may be injurious to the health of working people, the industrial processes in which the use of these substances is involved, and the symptoms each produces, is impossible. A study of the references given, however, will enable every physician in in-

[1] "Memorial on Occupational Diseases of the First National Council on Industrial Disease."

[2] Phosphorous Poisoning in the Match Industry, Bulletin 186, United States Bureau of Labor.

dustrial medicine to completely familiarize himself with this important subject.

Before a consideration of measures of prevention, a brief description of the more commonly found types of industrial poisoning and the industrial processes in which they frequently occur is in point.

Lead Poisoning

Lead poisoning is the most generally recognized and most widely spread of metallic industrial poisonings. The population at large is also frequently affected by ingestion of this metal from drinking water and beer pipes, bottled beverages where lead stoppers are used, canned goods, cosmetics, lead enameled cooking utensils, and a myriad other sources more difficult of detection. It is typically a cumulative poison, the symptoms appearing either as those of an acute or chronic intoxication. Some of the first suspicious symptoms of significance to the physician engaged in industrial medicine are pallor, lassitude, weakness or loss of weight, anorexia, constipation, or alternating constipation and diarrhea, arteriosclerosis, or high blood-pressure, tremor of the tongue or hands, wasting of the subcutaneous fat especially in the infra-orbital regions. Any of these may be the initial symptoms, and developing in a man who on careful physical examination reveals no other cause for it, and who is working at an occupation where he is exposed to the chance of lead poisoning, should be considered as gravely suspicious until the possibility of plumbism is entirely and definitely eliminated. The classical blue line on the gums, which is probably due to the formation and deposit of sulphide of lead through the action of sulphuretted hydrogen arising from decomposition in the mouth cavity, is unfortunately not so often seen, even in well developed cases, as was formerly believed, some recent investigations resulting in the identification of an unquestionable blue line in no more than 15 per cent. of several hundred lead poisoning cases. Its presence without other evidence is not positive proof that the person is under the influence of lead. Indefinite complaints of abdominal pain, not typical lead cramps, in a man exposed to plumbism are also sufficiently suggestive to justify the physician in placing the worker under observation and instituting repeated examinations. Arthritic pains, persistent headache, occasional slight fever, defective vision, neuritis, not otherwise explainable on physical examination, come in the same category.

With the development of compulsory routine medical examination or inspection of workers exposed to occupational disease hazards, and requirement by the state of the reporting of all cases found, the physician in industry is fortunately being held to stricter and stricter

accountability for the early diagnosis of lead poisoning. The routine periodical examination of such workers should be as thorough as possible. This must often, unfortunately, be made at the working place of the employee instead of in a physician's office or plant hospital. The following procedures are essential to such an examination if the earliest cases are to be detected:

1. Inquiry into the general health of the employee, especially in reference to headache, anorexia, joint, muscular, nerve or abdominal pains, symptoms referable to the special senses and history of the occurrence of constipation or diarrhea.

2. Examination of blood pressure, systolic and diastolic, and comparison with the reading at previous examinations, and palpation of accessible arteries for sclerosis.

3. Examination of the urine.

4. Examination of the gums for lead line and of mouth with a view to suggestions for the correction of dental conditions.

5. Observation of hands and tongue for tremors.

6. Examination of the grip and wrist extension of each hand by means of a manometer, both the grip and power of extension being taken. For the latter the manometer can be fitted into a portable wooden frame. The readings should be compared with those at previous nonths to detect the beginning of muscle weakness.

Any worker in whom any suspicious findings appear during such examination should be called to the physician's office or plant hospital for complete physical examination and here a complete history can also be taken, a procedure not feasible at his place of employment especially since a history of impotence, fetal death or abortion due to plumbism, and difficult to elicit, are of diagnostic importance in lead poisoning. The offspring may even be affected while the mother is normal and the father "leaded."[1]

By the most rigid medicolegal test a positive diagnosis of plumbism entails the fulfillment of Gowers's three postulates that:

1. Lead must be demonstrated as entering the body (this by a study of the chances of ingestion or inhalation of dust or fumes at the employee's work).

2. It must be demonstrated to be in the body by indisputable clinical symptoms such as for instance typical paralysis or lead cramps, or the typical changes in the red cells consisting of the diminution in the amount of hemogoblin accompained by structural changes in

[1] Paul cited in G. C. Nijhoffs article on Action on Ovum of Superfluous Semen. Nederl. Tijdschr v. Geneeskunde, Amsterdam, ii, No. 16. Cole and Bauckhuber: Proc. Soc. Exper. Biol. and Med., 1914. Weller C. V.: Jour. Med. Research, 1915, xxxiii, 271. Effect on Offspring of Lead Poisoning in the Father. Jour. A. M. A., December 25, 1915, lxv, No. 26.

these cells, as evidenced by the production of the well known basophilic granules therein. Other changes in the red cells less commonly recognized are decreased elasticity and reduction of the powers of resistance to chemically acting hemolytic agents. It must not be supposed that any of these changes are considered as pathognomonic or characteristic only of lead poisoning as these or almost identical changes have been demonstrated also in intoxications by phenyl hydrazine, dinitro-benzene, corrosive sublimate, and other poisons are well known to occur in such wasting diseases as pernicious anemia, carcinoma, leucemia, grave secondary anemia and tuberculosis. (In the author's experience the same blood findings have been noted in chronic cerebrospinal syphilis.)

3. The final postulate to be fulfilled is the demonstration of the excretion of lead from the body. Although development of lead nephritis, which is patho'ogically not distinguishable from other chronic Bright's disease, may occur as a late feature of plumbism, and suggests that an excretion of lead through the kidney often takes place, repeated examination of the urine even in well developed cases of plumbism generally fails to reveal the presence of lead. For clinical purposes it is generally granted that lead cannot be found in urine where no albumin appears. The demonstration of lead in urine should under most circumstances be left to the chemist as its positive identification involves fairly complicated chemical manipulation. The presence of a black precipitate in the urine through which the easily generated hydrogen sulphide gas has been passed during the examination by the physician, however, is sufficiently suggestive to indicate the advisability of a thorough chemical examination for lead. Elimination of lead principally as the sulphide from the feces does not of itself prove that the patient is " eaded," but shows, however, that he is ingesting the metal which may produce plumbism at any time and makes the correction of the faulty factory hygiene or personal habits of the patient, which permitted such ingestion, urgently desirable. Diagnostic tests for elimination by the skin are scarcely to be credited since such lead excreted by the skin cannot be differentiated from that in dust settling on the skin in the workshops.

However, wherever a worker even remotely exposed to plumbism presents any of the early symptoms suggestive of lead poisoning, he should be put under observation by the physician at the plant and subjected to repeated examinations and treatment applied until his symptoms have disappeared and the possibility of the development of plumbism eliminated.

The typical lead colic may be the first symptom of the disorder and some investigators, like Sir Thomas Oliver, believe that a worker is more likely to develop such cramps after a brief exposure than are

men exposed to the danger of being "leaded" over a period of many years and who often develop a tolerance to its action on the gastro-intestinal system. The typical colicky pains often set in with marked vehemence. They radiate from the vicinity of the umbilicus in all directions, the musculature of the entire abdominal wall becoming tense. Pressure on the abdomen generally relieves the pain somewhat. During the attacks the pulse may become quite slow. Catharsis generally fails to relieve such an attack. While these cramps frequently last from a few minutes to a half hour some are more stubborn, continuing with remissions for days. The attacks vary greatly as to frequency, following one another in a series or occurring singly weeks or even, in rare cases, years apart.

In untreated lead poisoning, motor nerve paralysis is very apt to develop although after the appearance of early symptoms some workers seem to develop a certain degree of tolerance to the action of the metal. The commonest type of lead paralysis is that first affecting the extensors of the wrists and later all the muscles supplied by the radial and ulnar nerves. Both hands are generally affected and the progress of the affection is typical, beginning with paralysis of the extensor digitorum communis, passing to the remaining extensors, then to the abductor muscles of the hand. Foot-drop, affections of the facial nerve and other paralyses are less common.

The early recognition of lead poisoning is essential to the protection of the worker and in properly conducted shops, with careful medical supervision, suspicious cases should be recognized as such, treated and removed from the injurious action of lead before the development of extreme anemia, basophilic degeneration of the red corpuscles, lead paralysis, or encephalopathy.

It is the concensus of opinion at present that all lead compounds must be regarded as more or less poisonous although formerly a large number of investigators contended that only those salts and compounds soluble in water or weak acids, or "the juices of the body" could be regarded as dangerous, holding that all others were incapable of being absorbed into the body and hence innocuous. The most readily soluble preparations, the acetate, chlorid, carbonate (white lead), oxid of lead (lead dross), and minium (red oxid) are most poisonous, the sulphate and iodid is less poisonous, and the insoluble sulphide probably is the least poisonous of all.[1]

Among the dangerous lead trades a few are conspicuous although poisoning has been demonstrated to occur in so many it is difficult even to enumerate them all. Oliver in his "Dangerous Trades" states that it is used in not less than 138 industries. Thompson mentions eighty-six. As an isolated instance of the prevalence of lead poison-

[1] Thompson: "The Occupational Diseases," p. 204.

ing in American industries, Dr. Hamilton found plumbism in thirty-three out of fifty-six factories inspected in the state of Illinois. As an illustration of the wide distribution of this industrial intoxication she has found it existing in the industries involved in the manufacture of white lead, litharge, orange mineral, red lead, glazing and decorating white wear and sanitary earthenware pottery, tiles, porcelain, in smelting works and lead mining, in the production of storage batteries and accumulators, in painting processes, rubber goods production, as well as many processes never thought of by most practicing physicians as involving such a hazard, *e.g.*, in the making of car seals, tin foil, wrapping cigars in tin foil, laying electrical cables, making artificial flowers, china painting, handling wall paper and many others.

A large number of lead poisoning cases have been reported in white lead works. In America there are four processes in use for its manufacture: the Old Dutch, the Carter, the Matheson and the Mild. In the first, which is the most common, the lead in thin discs is packed into pots of acetic acid and burned for about one hundred days. In stripping out the white lead thus produced, a great deal of dust is evolved and, in the type of this process used in the United States, the work cannot be made less hazardous by sprinkling or sluicing the lead with water as is done in England and Continental Europe. Unless suction exhaust ventilators are used in the dry pan room, a great amount of lead dust is inhaled by the workers here also.

In the Carter process, the men are handling finely powdered material and the hazard is great. The Matheson and Mild, rarely used in America, are wet processes where the hazard is great only while packing and grinding the finished product.

The roasting of lead oxids at the lead smelters or in connection with making of white lead, produces lead fumes from the furnaces and dust from dumping, grinding, screening and packing of the oxids.

The sources of lead poisoning in the pottery trades are from the ingredients of which the glazes are partly composed, the least dangerous glazes being those in which the lead is added at the beginning of their production and fused with the other ingredients into an insoluble disilicate, instead of adding it in a soluble and therefore poisonous form, later in the process.

The painting and allied trades are the most widespread and important lead industries. Among the most dangerous branches of these industries are interior house painting, ship and carriage painting, because these involve dry sandpapering of white lead paint, which is the greatest source of lead dust in the painting trade. In ship painting red lead is used and is generally dry sandpapered, or chipped off before a new coat is applied.

In compounding rubber the litharge and the basic sulphate of lead

are ground with crude rubber by warm cylinders and much dust is evolved. In wall paper mills and lithograph color shops minerals, some of which contain lead salts, are ground together in the dry state.

Sommerfield believes that plumbism in the printers trade rarely appears as the acute form, but develops insiduously with few early diagnostic symptoms, being manifested only by general reduction in health and by disturbances of digestion. The factory physician examining printers periodically for occupational diseases must, therefore, go over each case history thoroughly and make careful physical and blood examinations if he expects to diagnose the cases of plumbism in this trade. In corroboration of this opinion it is an interesting observation that in an intensive study of one hundred printers, taken at random from the trade in Chicago, in order to find the percentage presenting symptoms of occupational diseases, I found four with a history of occasional severe pains in the region of the cecum, but otherwise in fair health, who had been operated upon for supposed appendicitis and without any relief of symptoms subsequent to the operation. These, I believe, were quite probably mild cases of lead intoxication mistaken by the surgeon for chronic appendicitis. In the printing trade there has been a gradual replacement of the hand compositor who handles lead type and is exposed to dust arising from the type cases, by the type setting machine operator who, unless the machine is well hooded is exposed to the fumes arising from the molten metal. With this change in the method of handling type there is no reason to believe that lead intoxication has diminished in frequency. Beyer[1] believes that machine type setting increases it. Fumes from unhooded metal pots in the stereotyping and type casting rooms and the dust from the floor which has been found to contain as much as 14 per cent. lead are both dangerous to the printers.[2]

Zinc Poisoning

The chronic gastric, intestinal and nervous diseases found by the older writers occurring in zinc smelters which they regarded as due to chronic zinc poisoning are now accepted as certainly due to the lead always present in zinc and it is generally believed that there is no definite clinical condition which may be defined as chronic zinc or brass poisoning.

Zinc ague, known also as brass founders' ague, zinc chills, smelter shakes, metal shakes and brazier's disease is a form of acute industrial zinc poisoning. This ague occurs exclusively in brass casters and braziers and not in zinc workers. Sigel and Lehman[3] have shown,

[1] "Die Volkswirthchaftliche und Sozial politsche Bedentung der Finfuhrung der Setzmachine im Buchdruckgewerbe," p. 134.

[2] "Oliver: Diseases of Occupation," p. 180.

[3] Arch. f. Hyg., 1910, p. 358.

however, that it may be caused by burning pure zinc and inhaling the oxid therefrom. Lehman believes that the zinc oxid produces "proteid destruction" in the respiratory membranes with resorption of the destroyed cells into the system and that these dead proteids acting as toxalbumins produce the symptoms. This ague consists of an acute malaria like syndrome of a chill, sometimes accompanied by fever lasting one-half to three hours, terminating in profuse sweating and exhaustion. This chill appears an hour or so after inhaling zinc fumes usually in the form of brass or bronze fumes and generally affects those unaccustomed to such exposure. A temporary immunity is often developed after the attack.

Arsenic Poisoning

Soluble salts of arsenic act as an irritant to the skin causing pigmentation and sometimes the so-called "arsenic pock," setting up eczema and ulceration. General poisoning may be caused by the ingestion of salts of the metal or inhalation of arsenical fumes. Acute poisoning may result in death, while the effects of chronic poisoning are shown first upon the gastrointestinal organs and later upon the heart and nervous system. The first acute symptoms are anemia, nausea, vomiting, and diarrhea which is sometimes accompanied by severe abdominal cramps.

In the chronic cases, nerve affections such as peripheral neuritis with paresthesia and anesthesia, sometimes accompanied with edema, are more frequent than complete paralysis. When paralysis occurs, however, it often affects mainly the lower extremities thus differing from plumbism.

Excluding the cases due to arseniuretted hydrogen, the following table from the Report of the Chief Inspector of Factories, London, covering the years 1900–1913 inclusive, gives an estimate of the distribution of arsenical poison in various English trades with the frequency of occurrence.

Industry	Total cases
Manufacture of emerald green	46
Extraction of arsenic	8
Manufacture of sheep dip	5
Paint and color works	4
Chemical works	3
Smelting of metals (lead and copper)	3
Sorting bird skins	3
Wall paper manufacture	2
Shot making	1
Scraping paint off ships	1
Tanning	1
Unloading white arsenic	1
Indefinite	8
Total	86

The number of cases reported to the Chief Inspector of Factories during the same period as resulting from arseniuretted hydrogen gas was thirty-three and these were found chiefly in chemical works but also in the galvanizing trades, bullion refining, bronzing of art metal, paper manufacture, and tin plate works. Such poisoning often appears in industries where the working force and superintendent have no thought of the possibility of its occurrence. It is, however, rare. The symptoms generally set in a few hours after the inhalation of this garlicky smelling gas. Nausea is followed by repeated vomiting. Intense jaundice of the skin and conjunctiva then appears, and grave hemolysis occurs.[1]

Dr. Rogers reports that in America workers in the following industries are exposed to arsenical poisoning: making of artificial flowers, manufacture of candles and wax ornaments, manufacture of japanned goods, manufacture of carpets, fancy book binding, preservation of wood, manufacture of gloves, and of sheep dip, electroplating, lithographing and bronzing, manufacture of artificial leather, oil cloth, linoleum, cut glass, hat linings, beer, soaking of silk cocoons and enameling. He adds, "the majority of the workers are unaware of the poisonous nature of the material handled and where precautions are taken it is only because lead compounds are also used."

Mercury Poisoning

The symptoms of mercurial poisoning depend on the rate of absorption of the metal. It is possible that enough mercurial vapor may be inhaled in establishments where the working conditions are extremely bad to produce severe diarrhea due to acute mercuric chlorid or iodid poisoning. After this diarrhea is established it is accompanied by marked tenesmus and may become bloody in character. It is generally accompanied by vomiting. Renal symptoms may develop and anuria supervene.

Industrial mercurialism is often of the type which may be termed subacute and here the most prominent symptom is inflammation of the buccal cavity. There is at first only an increased flow of saliva, foul breath and disagreeable metallic taste in the mouth. Loosening of the gums from the teeth, pain on chewing and even ulceration of the cheeks and lips may follow. In the absence of a history of exposure to vapors of mercury or fumes of its compounds, this stomatitis is difficult to distinguish from that due to other causes, for instance, from carious teeth in which, however, the gingivitis is primarily localized about such teeth.

[1] Second Report of the Factory Investigating Commission, 1913, Vol, ii, p. 1161.

In mercurialism more slowly acquired and of a more chronic form, while stomatitis may be present and intestinal attacks may occasionally occur, cachexia, general emaciation, muscular tremors, decrease of strength, and symptoms of nervous and mental derangement, such as erethism, are more conspicuous. The mercurial tremor when well developed is somewhat typical and consists of coarse contractions and jerks, often accompanied by a finer tremor.

As metallic mercury gives off vapors even at ordinary temperatures, poisoning can occur in its recovery from the ore and in all processes in which it is employed, such as silvering of mirrors (in which the nitrate of silver and ammonia process is now replacing it), making of thermometers and barometers, incandescent electric bulbs in which a vacuum is produced by mercury pumps, e ectrical meters, manufacture of mercurial salts or explosives, derived from fulminate of mercury, rubber, cosmetics and dyes, bronzing, and in "carotting" furs with the nitrate and making felt hats.

Phosphorous Poisoning

The symptoms of industrial phosphorous poisoning are of the chronic type and result from absorption of white phosphorus or its fumes, phosphuretted hydrogen or fumes arising from heated phosphor bronze and ferrosilicon.

"Phossy jaw" or so-called phosphorous necrosis is a striking result of industrial phosphorous poisoning which usually starts around a carious tooth. It begins essentially as an "ossifying periostitis" resulting later in the formation of abscesses, sloughing of the periosteum and necrosis of the denuded bone. With this characteristic lesion of phosphorous poisoning, fragilitas ossium, anemia, indigestion, cachexia and bronchial catarrh may be associated.

Workers generally develop phosphorous poisoning only after working many years exposed to this hazard.

The symptoms of the rapidly acting phosphoretted hydrogen poisoning appear immediately after it is inhaled; dyspnea, coughing, fainting spells, noises in the head and nausea develop quickly, and in some cases coma and death supervene.

When phosphorus is produced from bones decomposed by sulphuric acid, poisonous fumes are evolved. In the distillation and purification of phosphorus, dangerous fumes both of phosphorus and phosphoretted hydrogen arise. One of the triumphs of industrial hygiene is the prohibition of the production at the present day of phosphorous matches. Ferrosilicon is used in the manufacture of steel and phosphor bronze in production of metals for use in manufacture of cartridges and cannons. In manipulating both of these, phosphoretted

hydrogen gas may escape. In the manufacture of acetylene gas, from calcium carbide, phosphoretted hydrogen is produced as an impurity.

VOCATIONAL HYGIENE AND PREVENTION OF OCCUPATIONAL DISEASES

The problem of eliminating diseases of occupation and preventing the enormous waste in human life and industrial efficiency due to their insidious action is a important as any facing the industrial world. This problem cannot be solved without the co-operation and concerted action of all concerned, the state, the employer, the employee, and the specially trained workers at their disposal, *i.e.*, safety engineers, efficiency experts, heads of departments of human maintenance in industries, factory inspectors and investigators, and medical men trained in the science of the early detection and treatment of these diseases.

Just as experience and special investigation have demonstrated that industrial accidents represent an unnecessary expense in the conduct of manufacturing enterprises and a preventable loss of working efficiency, so application of the principles of prevention of occupational diseases and protection of workers against them will, in the opinion of every man conversant with the loss of labor and productive efficiency due directly to these, gradually show on the books of the industries, in actual profits and in savings of expense of operating, the sound business judgment of applying these principles.

The conservation of the health, vitality, and industrial usefulness of wage earners is of concern to every person in a democratic nation. The protection of the worker and the prevention of occupational diseases and health hazards is necessarily a function of any government conducted "for the people." In the United States these problems can best be attacked through our legislative bodies, (1) by investigation either by special committees or by permanent boards and commissions, (2) by legislation, and (3) by administration and enforcement of such measures through special officers, and factory inspection departments, (4) by education of employer, employee, and the public in the dangers and avoidance of health hazards. All these measures are necessarily expensive. As an example, in the state of New York during 1912–13 the legislature appropriated $110,000 to the factory investigating commission, which did not include the usual sustaining funds for the permanent departments of health and labor.

Only after thorough investigation of the occupational diseases and health hazards specific to certain industries can rules for the prevention of health hazards and for proper industrial hygiene of employees be drafted. All provisions in England for factory acts relative to health hazards have followed the report of the Departmental Committee on Dangerous Trades which was actively engaged in investigation for

several years. All revisions of these acts are now based on the findings of special investigations ordered by Parliament. The present statutes covering the reporting and prevention of, and compensation for occupational diseases in Illinois, New York, and a few other states, are the legislative results of the reports of Occupational Disease committees.

About the year 1870 general interest in the discussion of a project for the establishment of some international organization for the protection of workers first began to appear. In 1873 the socialist party in France suggested the possibility of such a plan. Von Bismark was naturally opposed to the participation of Prussia in any type of international convention. During the next few years trade unions in England, France and Switzerland continued the discussion of the project and in March, 1890, the first international conference for the protection of workers was held. It has met regularly since that time in various countries. The study of methods of codifying the laws governing labor conditions, the collection and publishing of literature bearing on the protection of laborers, and the prevention of health hazards have occupied the attention of this body. The prevention of the use of white phosphorus in making matches in various countries has resulted directly from suggestions made by this conference. International agreements for the protection of workers are highly advisable on economic grounds, since if every nation makes its own restrictions, advantage in the worlds market is thereby granted to the nation whose manufacturers are allowed to produce articles by cheap, hazardous methods prohibited in other nations. Also, it is reasonable and just on humanitarian grounds that workers should be protected irrespective of race or nationality.

FEDERAL LEGISLATION AND ADMINISTRATION

The authority of our federal government in the interest of public as well as industrial health rests in the clause of the Constitution relating to the power of Congress over the operations of interstate and international commerce, and the clause relating to common welfare. By an act approved August 14, 1912, the United States Public Health Service "was authorized to study and investigate the diseases of man and the spread thereof," and to publish information to the public. On August 23, 1912, Congress authorized the appointment of a temporary "Commission on Industrial Relations" among whose duties is that of inquiring into matters relating to the health of employees. On April 9, 1912, Congress established the Children's Bureau which has among its functions the investigation of child labor in the industries. As a result of the recommendations of the International Associations and the investigations of the occur-

rence of phosphorous poisoning[1] in the match industry in this country, by agents of the United States Bureau of Labor in 1900 and in 1909, and the American Association for Labor Legislation, Congress on April 9, 1912, passed an act abolishing the use of phosphorous matches by laying a prohibitive tax upon them.

With the entrance of our country into the world war and the subsequent increase in production of war materials under government contract, a great opportunity has been given to the federal government to supervise and control all health hazards in those industries under such government contracts. Protection of employees is essential to speeding up of production. Therefore, the federal government should include in every contract provisions for the protection of employees against all occupational conditions tending to destroy efficiency by disease or accident hazards.

The functions of the United States Department of Labor are limited to the work of "investigation and study and diffusion of information regarding the means of promoting the material, social, intellectual, and moral prosperity of the working men and women." It is quite within its scope therefore to study factory processes and conditions with a view to eliminating, restricting or safeguarding the use of poisonous and injurious materials, or to study lighting, ventilation, humidity, the disposal of dust and fumes, and the improvement of the hygienic conditions of the working places. In the group of its reports relating to factory inspection and occupational hygiene, are included articles in regard to the inspection of factories and workshops in this and in foreign countries. Detailed suggestions in regard to factory inspection and legislation, and the regulation of working conditions, especially in industries and occupations involving special dangers, have been made the subject of particular attention. Special studies have also been made of the morbidity and mortality in certain dangerous occupations and of the dangers to employees who, in the course of their work, come in contact with poisonous materials. Under this head the most important work which has been done is the study of phosphorous poisoning in the match industry, of lead poisoning in the lead industries, and in the manufacture of pottery, tiles, and porcelain enameled sanitary ware, and the recent studies in T. N. T. and other munition poisonings. In all these industries investigation has disclosed the existence of dangerous conditions most of which may be entirely eliminated, or very greatly improved, without serious difficulty. All of these investigations have strongly emphasized the fact that by a study of working conditions in the more dangerous and unhealthful occupations, the

[1] Phosphorous Poisoning in the Match Industry by John B. Andrews. Bulletin 86, United States Department of Labor.

best methods of prevention may be made available for use in those factories where, "because of ignorance or because of the indifference resulting from ignorance, dangerous conditions have been allowed to continue without any technical necessity and without any economic need."[1]

There are three principal legislative methods for the prevention of occupational disease:

1. By prohibition.
2. By regulation including inspection of employees and factories, licensing, notification of cases, and by special rules for employment in special industries, hours of labor and rotation or variation of employment.
3. By compensation and insurance.

The method of prohibition may apply to (1) processes or substance used, or (2) certain classes of people who are restrained from participating in dangerous trades. Laws have been enacted in many foreign countries, and in some of our states, by which children under a specified age or even all minors, and also women of certain ages, are prohibited from participating in any work which is considered dangerous or from working in any establishment where poisonous dusts or injurious gas or fumes are evolved. In America these prohibitive laws for women, in most states, relate only to employment in mines and saloons. Women are forbidden to work in mines in most of the mining states and in saloons in about sixteen states. In a very few states women are prohibited from the use of emery, polishing or buffing wheels where articles of iridium or of the baser metals are being manufactured. In New York and a few other states women are prohibited from night work. In Argentina, England, Germany, France, Italy and Holland women are prohibited more or less completely from work involving the use of lead. In America, however, although their peculiar susceptibility has long been known, they are widely employed in potteries, usually in dipping the ware in lead glaze, decorating with lead colors, and cleaning or sweeping floors or tables where lead dust is present. In America, as is shown by careful investigation, the ratio of cases of lead poisoning among women employed in potteries is one in seven, while in Great Britain the ratio is one in sixty-four.[2]

In the case of lead prohibitory legislation has been enacted in several European countries to affect certain industries and processes. In 1908 Austria forbade the use of lead in all paints, colors, or

[1]Verul, Chas. H.: "The Relation of the U. S. Department of Labor to Industrial Hygiene." Fifteenth International Congress on Hygiene and Demography, Vol. i, Pt. ii, p. 714.

[2]Andrews, I. O.: The Protection and Promotion of the Health of Women Wage Earners in "Diseases of Occupation and Vocational Hygiene," p. 134.

cements used for interior work, while the Swiss Government prohibits its use in the form of white lead in all painting done under the authority of its executive departments. In 1909 France enacted legislation to be effective in July, 1914, forbidding use of white lead, of linseed oil mixed with lead, and of all products containing white lead, in all painting of any nature, either on the outside or inside of buildings.

In textile mills, tuberculosis and other contagious diseases have been spread by employees sucking thread into shuttles and accordingly in 1911, Massachusetts prohibited the use of any form of shuttle which in threading required the employee to use his lips or mouth.

Fig. 36.—Helmet used to protect eyes and face of arc-welders from ultra-violet rays. (*General Electric Co.*)

The second set of legislative methods for the prevention of occupational diseases and the promotion of health of workers, that of regulation, apply to a large group of occupations and processes where injurious materials or conditions are present but where the ill effects on the employee's health are less definite. This group includes all those occupations where the workers are exposed to the harmful action of extremes of temperature, excessive humidity, insufficient,

poorly regulated or distributed light, impure air, overcrowding, exposure to infectious diseases, dust and fumes, excessive speed, extreme strain or fatigue. While these and many other working conditions produce a marked effect upon the health of working people and render them more susceptible to such diseases as rheumatism, tuberculosis, anemia, pneumonia, bronchitis and other diseases of the respiratory tract, functional and nervous disorders, eye diseases and orthopedic derangements, yet it is often difficult to designate them specifically as due to occupational causes since conditions outside the work may play a part in their production. There are, however, many diseases unquestionably due to industrial hygienic conditions or poisons which can best be controlled by careful governmental regulation.

The control of working conditions in the industries by the government is accomplished by means of the enactment of specific laws or statutes or through the agency of rules or orders issued by administrative authorities. In America legislation is unfortunately often couched in terms too general or ambiguous and so easily misconstrued by the courts and almost always too laxly enforced. Many times the bill carries no definite provision for sufficient, well paid, competent officers to enforce its regulations.

Provisions for competent inspection of dangerous trades must include not only the requirement of frequent visits by inspectors to industrial establishments in which poisonous gases, fumes and faulty working conditions are found, but also the delegation to such inspectors of the power to enforce observance of regulations.

Compulsory reporting of some of the occupational diseases and cases of industrial poisoning is being included in practically all statutes covering this subject which are being passed by the legislatures of the industrial states. Unless the data supplied by such reports is carefully tabulated the extent of protection needed and the results and success in the prevention of disease by such measures as are being applied cannot even be estimated. Such reporting of cases must necessarily devolve upon physicians since, because of their training, they are the only class capable of recognizing maladies due to occupational causes. Among physicians men especially trained in occupational disease detection are infinitely more valuable for such work than the average general practitioner because many of the symptoms of occupational diseases have but recently been recognized and the existence of these diseases in many trade processes is only now being discovered by men specially interested in the subject. It is a new field. The teaching of the intimate relation of occupation to disease is not emphasized in the average medical school curriculum. In Illinois, Missouri, New Jersey, Ohio and Pennsylvania the laws require all employees engaged in certain occupations carrying a

high health hazard to be examined at least once a month for the detection of any ill health or disease resulting from their employment.

In most of the states, requiring notification of these diseases, they are reported to the state board of health, while in a few to the state department of labor. In order that such reports may be of definite value to the department in which they are filed, they must be uniform and complete enough to permit of study and comparison in order that future legislation governing the health of workers may be based upon evidence deduced from them. They should show the nature of the symptoms of the existing disease, the duration, time of onset, prodromes, age, sex and previous health of the worker, a full account not only of the specific work and materials concerned with the patients' employment but also the general nature of the employees' hygienic surroundings should be included. The value of such reports will be greatly enhanced by the adoption of a uniform record for the use of all states, which will be of great aid in securing uniform legislation on this subject. Through the efforts of the American Association of Industrial Physicians and Surgeons it is hoped that such a uniform history record may be voluntarily adopted by all physicians and investigators.

In the United States the power to regulate and control working conditions except as they affect foreign or interstate commerce directly rests with the individual states based upon their "police power"[1] and the "authority to secure the public welfare."

Laws requiring the reporting of occupational diseases are all of recent origin. Most of the bills passed in the states have been copies or modifications of the standard bill suggested by the American Association for Labor Legislation. In 1911 California, Connecticut, Illinois, Michigan, New York and Wisconsin passed laws requiring notification of occupational diseases. Maryland and New Jersey enacted such legislation in 1912; Maine, Massachusetts, Minnesota, Missouri, New Hampshire, Ohio, and Pennsylvania in 1913; and Rhode Island in 1915. The Missouri law is the most comprehensive of these: employees engaged in manufacture in which antimony, arsenic, brass, copper, lead, mercury, phosphorus, zinc, their alloys or salts or any poisonous chemicals, minerals, acids, fumes, vapors, gases or other substances are generated or handled by employees in harmful quantities or under harmful conditions, are required to be examined at least once a month by a physician to ascertain whether there exists in such employees any disease due or incident to the character of the work in which they are engaged. The examining physicians are within twenty-four hours to make a report to the state board of health in triplicate upon blanks furnished by the state. If disease incident to

[1] Freud, E.: "Police Power," pp. 3–7.

occupation is found, the secretary of the state board of health is to send one copy to the state factory inspector and one to the superintendent of the factory in which the employee is supposed to have contracted his ailment.

We can best illustrate methods of legislation covering occupational health hazards in America by reference to recently enacted statutes in a few of the industrial states.

Illinois.—"The Health Safety and Comfort Act" covers the regulations to secure adequate ventilation both artificial and natural, work rooms and proper toilet facilities for both sexes, the disposal of noxious fumes, gases, and vapors, proper regulation of temperature in workshops and seats for women. Another statute deals with the use of blowers on metal polishing and grinding machinery. In July, 1911, the "Occupational Disease Act" was passed requiring the installation by employers of certain standard appliances for the prevention of occupational diseases especially among employees exposed to poisoning by the fumes of lead or other metals in such processes as the manufacture of brass or smelting of lead and zinc. These provisions were adopted as a result of the investigations and report of the Illinois Commission on Occupational Diseases.

In this state the duty of the enforcement of these laws and prosecutions under them devolves upon the chief factory inspector and his staff. The penalty either for violating the law or obstructing the inspectors is a fine of $10 to $50 for the first offense, and $25 to $200 for later offenses. On the discovery of the violation of the law the inspector is to notify the manager. It is further required that the essential text of this law in various languages be posted in all establishments covered by the statute. Under the "Health Safety and Comfort Act" and the "Occupational Diseases Act," physicians and dentists are employed by the factory inspector to make daily investigations and personal inspections of plants. Some research has also been done by the staff as to the effect of certain metallic poisons on animals. Provision is made for routine monthly examination of all workers exposed to the danger of poisoning by metallic dusts or fumes, by physicians paid by the employer, with immediate reports to the state board of health, who in turn notifies the department of factory inspection of any cases of occupational disease found. An employee, or his family, has the right of action for damages up to $10,000 if he be affected by metallic poisoning in an industry where employers have not fulfilled the requirements of the law as to protective measures and examinations.

Michigan.—Here the Governor is authorized to appoint a commissioner of labor for two years and he in turn may appoint factory inspectors and assistants. It is the duty of this commissioner to report

on the "moral and sanitary conditions of the laboring classes and the productive industries of the state" (Act 185, Public Acts of 1909 (amended 1911)) and to inspect all working places. The hours of labor for women and children, and employment of these in certain occupations is restricted; provision is made for the installation of fans for dust removal; toilets and lavatories are required. There are special requirements for seats for women, factory ventilation, sanitary regulation of mines and of work in tenement houses. Complaints of neglect of the law are to be made to justices of the peace or magistrates. Provision is made for the reporting by the local boards of health of contagious and infectious diseases to the factory inspector of the commissioner of labor.

Missouri.—As was mentioned above one of the most comprehensive statutes in the United States providing for reporting and recording cases of occupational diseases is in effect here. In June, 1913, the first "Occupational Disease Law" was put in force. By the provisions of this law it is the duty of all licensed physicians to report such cases as come under the act to the State Board of Health in duplicate, one copy being sent to the manager of the industry employing the afflicted workman and one to the factory inspector's office. Provision is also made for hygienic supervision of work rooms, special work clothing to be worn by employees and separate eating places in dangerous trades, proper drinking water and drinking fountains. The proper measures for inspection and enforcement of these regulations and prosecution of violators by the state factory inspector as well as a requirement for the posting of notices of the provisions of the law are included.

Maryland.—In 1912[1] a state department of health was established. The statute in this state defines and describes occupational diseases and requires the reporting of cases found by physicians to the state board of health. This body is empowered to call upon local boards of health and health officers for aid in inspections and the enforcement of the law. A system of warning notices is required to be posted by employers.

New York.[2]—The commissioner of labor appointed by the governor by and with the advice and consent of the senate, for a term of office of four years, has supervision of the department of labor. He appoints all officers and clerks of this department. One of the three bureaus in the department is that of factory inspection which is comprised of a chief factory inspector and staff including one medical inspector of factories. This medical inspector makes yearly reports. These have contained studies of different industries in New York for the detec-

[1] Ch. 163, Law of 1912.

[2] New York State Department of Labor Ann. Rep. of Commissioner of Labor 1911–1912. Labor Laws of U. S., p. 905 (Acts of 1907).

tion of occupational diseases. Hygienic exhibitions for public instruction have been prepared by the bureau, and recommendations made for better methods of ventilation of shops and removal of dust, fumes, gas and vapors. The work of medical inspection in this state is of course greatly handicapped by its limited size.

Ohio.—In March, 1913, legislation was enacted requiring physicians to report within twenty-four hours from the time of attending such patients, cases of occupational diseases contracted as a result of employment, or due to poisoning from lead, phosphorus, arsenic, brass, wood alcohol, mercury, or their compounds. Considerable latitude is allowed by the board of health as to the forms of reports and extent of information demanded. Since May, 1913, Dr. E. M. Hayhurst, who was one of the medical investigators of the Illinois Commission on Occupational Diseases, has been in charge of the work conducting a "survey of occupational diseases" for the state board of health preliminary to the drafting recommendations for future legislation and administration. In the board of health of Ohio are vested powers of supervision of all matters relating to the preservation of the life and health of the people. "It may make special or standing orders of regulations for preventing the spread of contagious or infectious diseases . . . . . and for such other sanitary matters as it deems best to control by general rule." Violation of such regulations are to be prosecuted in the courts by customary procedures.

Pennsylvania.—By an act of June 1, 1913, the commissioner of labor and industry is appointed by the governor with consent of the senate. Provision is made for a chief medical inspector with a staff of physicians as assistants as well as medical, chemical, and civil engineers, and also a division of industrial hygiene. This department has done excellent work under Commissioner Jackson, assistant commissioner Palmer, and medical director Dr. Francis Patterson.

Massachusetts.—In June, 1912, an act was passed to establish a state board of labor and industries. Prior to that industrial hygiene had been under the control of the state board of health. The new board consists of one employer, one laborer, one physician and one woman. This board appoints a commissioner of labor. In this board is vested the power to investigate labor conditions, hold hearings, seek expert advice, and prosecute violators of the law, and the duties formerly exercised by the police and health department in relation to the enforcement of laws governing hygiene in the industries. This new board has health inspectors who are required to be medical men, while medical men are also employed by the department of health but have, however, no authority in enforcing laws regarding factory conditions.

Wisconsin.—The state industrial commission is empowered to make

effective the state law which expresses in general the duty of employers to protect life, health and safety of employees and the duty of the latter to co-operate in carrying out this purpose. It has the authority to call in experts in hygiene and engineering to assist in the establishment of definite standards and rules. In the drafting of such regulations employees and employers have a right to be heard. This method of adopting legislation is slow and depends for its efficiency entirely upon the type of men appointed to the commission.

The above are sufficient examples to show the trend of legislation in respect to industrial hygiene in the United States.

MUNICIPAL HEALTH BOARDS AND COMMISSIONERS

In America the functions of city health departments have been directed toward the establishment of public hygienic conditions in general and not in the industries specifically or in particular. Rarely have municipal authorities attempted to study or regulate working conditions in the industries.[1] It is interesting to note that in 1910 in New York in one group of trades, that of the garment workers, a joint board of sanitary control comprised of representative for the employers, workers, and the public has been organized to establish standards of hygienic conditions and enforce them.

LICENSING

The system of licensing dangerous occupations gives the government an additional means of enforcing factory legislation and inspection. By this system special requirements must be fulfilled and laws governing construction and equipment must be adhered to before dangerous industries can be licensed. It is always easier to prevent than cure faulty hygienic conditions and this system of licensing after thorough inspection of plans and specifications in vogue in foreign countries is probably destined to be extended to the dangerous trades by the states or Federal Government of the United States.

SPECIAL PREVENTIVE MEASURES FOR WORKERS

The practical measures which may be used in the protection of workers against trade risks involve limitations and restrictions of three sorts, (1) upon the methods of handling the dangerous materials, (2) upon the period of exposure to the harmful action of these materials, and (3) upon the persons exposed. These are seldom applied separately and it is feasible to consider the methods of application of these limitations as they can be applied to the processes involving the use

[1] Wald, Lillian D.: 15th International Congress on Hygiene and Demography, Vol. iii, Pt. ii, p. 881.

of various dangerous materials. It is however obvious that in a consideration of the third group it is desirable to select for employment in a dangerous trade persons possessing powers of resistance and exclude those who, because of predisposition or lowered resistance, are especially susceptible to trade poisoning. Such susceptibility varies in individuals and, as discussed above in the case of lead, in the two sexes.

In a rough way such a selection naturally occurs without supervision since those susceptible are obliged by repeated attacks or increasing disability to give up the particularly harmful work. From the standpoint of industrial economy as well as humanitarian considerations such a method of selection is intolerable. While, unfortunately, exact tests for susceptibility applicable to applicants for work by the examining physicians are at present lacking, it is still true that industrial physicians may acquire an aptitude for the general grouping of applicants for work, picking the robust for heavier labor and selecting for the slightly defective or poorly muscled various less strenuous occupations which will not put a special strain on the weakest part, *e.g.*, the myopic eye, the defective heart valve, the broken arches, or the inguinal canal protected by inadequate muscular development. The physician engaged in this work is governed by considerations, difficult to formulate, in the choice of, or exclusion from certain employments, as for the anemic, the worker of poor lung power, or small vital capacity. As his experience in such work grows, he becomes a specialized employee most valuable to the plant.

Further, workers engaged in industries involving a high health risk or who possess special limitations in physical strength as do women and children should not be kept working too long at a time. This can be regulated either by shortening the hours of labor or by changes or variations in the type of labor. In 1912 our Federal Government set a precedent for an important standard by enacting legislation forbidding contractors on federal work to keep men at work longer than eight hours in one day. A few states have since limited the working day to eight hours while some have restricted work to six days a week. If such restrictions are important for labor in general they are doubly urgent for dangerous trades.

An example of the limitation of tedious work for the adolescent is that of Berne where no girl under the age of seventeen may be employed at a tredle machine for more than three consecutive hours a day. In regard to night work nine states have legislation prohibiting, under certain conditions, women and children for such work. Connecticut, Massachusetts, New York, Vermont and most European countries have enacted legislation prohibiting women from working for fixed periods before and after confinement. Unfortunately

restrictions barring especially susceptible individuals from the dangers of industrial poisoning are not yet widely adopted.

Periodical medical examinations such as are required in Illinois, Missouri, New Jersey, Ohio and Pennsylvania in the occupations where high health hazards exist are most valuable in discovering and weeding out the physically unfit and the victims of industrial poisonings before these symptoms present a permanently disabling or handicapping stage of these disorders. Such work presupposes special training and experience in the physician employed in inspection.

Further, in some occupations involving the chance of development of sudden acute poisoning, there should be a trained staff of fellow employees competent to recognize the earliest symptoms of poisoning and to render first aid, and these should be equipped with appliances adequate for this purpose. In addition to special appliances needed in special trades, attention is directed to the use of oxygen apparatus as a means of life saving. For rescue work in poisonous atmospheres, gas masks or breathing helmets must be readily available and medical assistance be easily accessible.

The co-operation of the worker in the early detection and examination for signs of intoxications is indispensable. He must be taught the aim and purpose of preventive measures and the inestimable importance of his own scrupulous care in enforcing all means directed toward his defense as well as the untoward results of the neglect of such considerations. Among the various methods for teaching employees are lectures and class room instruction by the factory or union physician, the sanitary engineer or other members of departments or human maintenance; and concise instructions, in the form of notices or illustrated placards, handed the employees, placed in their pay envelopes, or posted up in workrooms. Often the most perspicuous type of "welfare advertising" is that which develops the generalized from the specific by citing an actual case of an employee known by the rest of the working force. For example, John Doe is described as a case of "gassing" followed by an analysis of the methods which should be employed to prevent such occurrences.

Of preventive measures applied to the handling of poisonous material those are of prime importance which protect the worker as far as possible from coming in contact with the poison. This is attained (1) by wearing suitable clothing, (2) by the use of respirators or protectors against inhaling poisonous materials, and (3) by careful cleanliness, especially before partaking of food. Overalls over ordinary clothing are not sufficient protection. The ordinary clothing must be taken off before the commencement of the day's work, in a separate dressing room apart from the workroom, with adequate arrangements for bathing thoroughly before the ordinary

clothes are resumed at night. Working suits of smooth, washable material must be put on, to be taken off again before the midday meal, and before leaving work at night. Where direct handling of poisonous substance is unavoidable, impervious gloves may have to be worn but this depends upon the possibility of skin absorption of the particular poison involved.

Protection of the respiratory organs is difficult to provide for and to enforce. Respirators to be worn over the nose and mouth, or

Fig. 37.—Illustrating the use of respirators and proper shop clothing as protection against occupational disease. Munition factory in France.

head helmets for use where fumes or dusts are more abundant, are varied in construction. The pressure of such apparatus on the face becomes tiresome and where they must be worn employees must be selected who can become accustomed to their use as many men never can.

Regular rinsing of the mouths (especially before meals and on leaving work) of those who work where poisonous substances give off dust or fumes, is of utmost importance. Employees handling extremely poisonous chemicals should be required to bathe before leaving work at night and to wash the hands and face thoroughly before the midday meal. The shower bath is the most convenient and time saving form of bathing. The taking of meals and the use of tobacco in workrooms must be prohibited.

The maintenance of a robust health and fit physical condition

is one of the most effective means of protecting the worker against the health hazards peculiar to the industries. It is continually demonstrated in chronic industrial poisoning that the ill fed, poorly nourished, asthenic, or anemic worker is the first affected and the earliest to succumb. The problem of the prohibition of the use of alcohol to men exposed to industrial poisoning is especially pertinent in the case of plumbism in which the deleterious effects of its use have been most carefully studied.

The substitution of non-poisonous for the poisonous materials and of the safe for the dangerous processes is the joint problem of the physician and the safety engineer. The following are examples of some of these suggested substitutions: "wet" methods (watering white lead chambers, grinding pulp lead, polishing, scraping, and finishing painted work with oil, damping of smelting mixtures) in place of "dry" methods where dust is evolved; the substitution of the safety for the phosphorous match; replacing the tin and mercury amalgum by the nitrate of silver and ammonia process in silvering mirrors; electroplating instead of coating objects with mercury and volatilizing the excess; enameling and painting with leadless instead of lead enamels and paints; the use of air pumps in place of mercury pumps in producing the vacuum in incandescent electric lamps.

Next to personal cleanliness the most important consideration in the prevention of industrial poisoning, and of primary importance in the prevention of ill health caused by dust is the cleanliness of the workroom and purity of the air. Working places should be light and lofty with floors constructed of impervious material easily cleaned, and walls lime washed or painted with white oil paint. Angles and corners should be rounded.

The necessity of maintaining the purity of the air of the workroom requires as a minimum of air space per person 10 to 15 cubic meters and this should be exceeded wherever possible. In modern soundly constructed workrooms the "natural" ventilation from windows, doors and the porosity of building material will not supply the necessary volume of air quickly enough. By such means the air is rarely renewed in less than one to two hours. In workrooms, for more than a very few persons, artificial ventilation becomes imperative. This is effected by special openings or ducts arranged in the room so that either (1) fresh air is propelled into the room, or (2) by exhaust ventilation, air is extracted from the room. The agencies which may be employed to produce a draft in ventilating ducts are (1) by utilizing the action of the wind, in which case a cowl must be fitted to the exit of the ventilating duct; (2) by heating apparatus; (3) by heating the air in the exhaust ducts as for instance when they are lead into chimneys or furnace flues; (4) by the use of fans mechan-

ically employed. Where there is any considerable amount of dust, or the danger of poisoning is present, by far the most expedient ventilation is by power fans by which exact regulation of the purity of the air can be calculated and assured irrespective of differences of temperature, velocity of the wind, etc. These are of two types, the propellor and the centrifugal. The first type has curved blades set at right angles in the duct and acts upon the column of air by suction, moving it in the direction of the action of the fan. A low pressure draft, that is one of a pressure generally less than 15 mm. of water, is produced; the air traveling at a slow speed. These fans are especially suitable for general ventilation of rooms while the centrifugal type, in which the air is drawn out by rapidly moving straight blades through openings in the periphery of its casing, traveling at a high speed and producing a pressure not lower than 120 mm., is especially applicable to the local exhaustion of dust or fumes from the point where they are produced.

SPECIAL REGULATIONS FOR THE CHEMICAL INDUSTRIES

The Sulphuric Acid Industry.—Hazards of two kinds are encountered here: (1) those arising from the escape of acid gases and (2) those endangering the men entering chambers, towers, and containers for the purpose of cleaning these. For hygienic as well as economic reasons the whole chamber system should be impervious to gases. The escape of fumes from the pyrites furnace is accomplished by maintaining a negative pressure inside by fans. Cinders from the furnaces must be cooled in a covered place. Rambousek says that the acid content of the final gases can be reduced to 0.1 vol. per cent. with a maximum of 0.26 per cent. of sulphur dioxid. Cleaning out chambers and towers, if they must be entered, should be done by men equipped with breathing apparatus. One German factory has the following regulations.

"The deposit of the floor of wagons or tanks shall be removed either by flushing with water without entering the tank itself, or if the tank be entered the deposit is to be scooped out without addition of water or dilute soda solution.

"Flushing out shall only be done after the workmen have got out.

"Workmen are to be warned every time cleaning is undertaken that poisonous gases are developed when the deposit on the floor is diluted.

"Acid eggs, further, are to be provided with a waste pipe and manhole to enable cleaning to be done from outside."

Hydrochloric Acid, Salt Cake, and Soda Industries.—The general principles applicable to the avoidance of acid fumes must be followed.

Proper construction prevents the escape of fumes from the salt cake pan and reverberating furnaces. The following regulations are in substance those which have been in effect in England for many years.

The salt cake pan must not be charged when overheated.

Sulphuric acid shall be added only after all the salt has been charged and the door shut.

If hydrochloric acid fumes escape at the door when the Glover acid flows in, the flow must be interrupted.

All doors must be closed while work is in progress.

Definite times shall be fixed for withdrawal of the salt cake in order to try and ensure that it be not still fuming, but should this be the case, cold sulphate of soda shall be sprinkled over it.

A slight negative pressure should be maintained in the furnace by means of the insertion of a fan in the gas conduit to prevent the escape of fumes. The fuming salt cake is best cooled in ventilated receptacles.

Bleaching Powder, Chlorin and Its Compounds.—The same principles as to imperviousness of apparatus and maintenance of negative pressure as described above apply here. At the end of the system the last traces of chlorin gas should be absorbed by a tower of quicklime or series of bleach chambers. Production of chlorin gas electrolytically is the least dangerous method. Mechanical handling of bleaching powder is far more hygienic than hand labor.

Nitric Acid and Explosives.—Complete imperviousness and condensation of gases is feasible and should be insisted upon. Valentines method under a partial vacuum is the best from a hygienic viewpoint. Great care in handling and packing the acid is required and warnings against remaining in rooms where it has been spilled should be posted. The rules mentioned above, cleaning wagons and receptacles for sulphuric acid, apply to nitric also. The rules of the Massachusetts State Board of Health for acid manufacture cover the necessary hygienic precautions admirably.

In the nitrating processes in explosive manufacture, the apparatus must be hermetically sealed and the agitation be done by compressed air or mechanical means and any fumes developed exhausted and condensed. The gases evolved from nitroglycerin are especially dangerous. The attention of the workers must be drawn to this and to the danger of contact of this chemical with the skin or of wearing clothing contaminated with it away from the factory. In producing gun cotton all the work should be done by machinery and the fumes exhausted. Fulminate of mercury production requires exhaust ventilation.

Trinitrotoluene (TNT) Poisoning.—The possibility of poisoning

from TNT has been recognized for several years but as a result of the war it has forged to the front as one of the most dangerous occupational poisonings connected with munition work. The poisonous material in TNT is composed chiefly of one of three isomeric trinitrotoluenes, called the symmetrical group, because the three NO_2 groups are symmetrically arranged on the toluene nucleus. The commercial variety contains also insignificant quantities of the other two isomers and a variable percentage of mono- and dinitrotoluene, together with small amounts of nitrated methanes and other substances.

Dr. Alice Hamilton[1] gives an excellent review of the causation and prevention of this type of poisoning, based on the work done in England by Dr. Benjamin Moore and his assistants. The following conclusions are cited:

"1. TNT is absorbed through the skin, and that is the only channel of absorption which is of any practical importance.

"2. Consequently elaborate systems of exhaust ventilation to carry off fumes are not necessary, for there is no case on record of poisoning from TNT fumes alone. The wearing of respirators is not advised, since the amount of dust that can be breathed in is too small to be harmful. Dust is dangerous only as it falls on the skin or clothes or on surfaces that must be handled.

"3. When TNT is swallowed deliberately by experimenters, the effect is as slight as when the same amount is inhaled.

"4. TNT readily makes its way through the skin and is absorbed, setting up in susceptible persons a slowly increasing intoxication.

"5. Therefore the prevention of TNT poisoning depends on two factors—first, strict cleanliness of the factory premises, so that there will be as little actual contact with TNT as possible, and second, close watch of workers to eliminate that minority which has a low resistance to TNT. Since, however, it is impossible entirely to protect the skin from contact with TNT in manufacturing and in shell-filling operations, the importance of the second factor becomes evident. In spite of the best efforts to do away with all skin contamination there will be inevitably some contact with the poison, and though the majority of workers will be able to tolerate the small amount they absorb, a certain amount will be unable to resist its effects, and it is this group of workmen that must be discovered and removed before actual injury has taken place.

"In a word, the prevention of TNT poisoning depends on cleanliness of the work place and ever watchful medical supervision."

TNT acts on the blood, changing the hemoglobin into a mixture of "*NO*-hemoglobin and methemoglobin." Thus the altered hemo-

[1] Industrial Poisons and Diseases. Monthly Review. United States Department of Labor, May, 1918.

globin cannot function as oxygen carriers, giving the symptoms of air hunger. This is the earliest stage of TNT illness and the symptoms complained of are breathlessness, tightening in throat and chest, dizziness, drowsiness, nausea, and abdominal pains. Cyanosis frequently develops in this stage and may be very slight or extremely marked. Marked cyanosis may appear while the patient yet feels quite well. A marked aplastic anemia originally develops, showing a decrease in the red cells to 1,500,000, or even lower. The hemoglobin is reduced to 30 or 40 per cent. The picture is that of a pernicious anemia.

The early cases of TNT sickness present almost a characteristic appearance. "The face is pale, lacking in expression. The lips have an ashen blue color and the same color is seen on the gums." There may be a faint trace of yellow in the whites of the eyes, the rest of the skin showing no jaundice. When these are observed the physician should question the worker and he is then likely to be told of abdominal pains, dizziness, sleepiness, breathlessness, headache or nausea, and dark colored urine. But this history may or may not be given, according to whether the worker feels like resting or keeping on with work. Dr. Moore of England states that the physician should patrol the plant at frequent intervals, familiarizing himself with the workers as they appear normally, and thus become able to detect those slight changes which show to the experienced eye the beginning of ill health.

In the serious form TNT poisoning causes a toxic jaundice. Dr. Moore regards both jaundice and fatal anemia as secondary results of the same action of the poison as cause symptoms of cyanosis. When the jaundice begins to appear it is quite evident that the bone marrow and liver tissue have been attacked and the patient has reached a dangerous stage of poisoning. This is usually presented by signs of cyanosis and if these cases are removed from the hazardous occupation in the early stages the accumulated poison in the body will soon be eliminated, but if he is allowed to continue at work within a short time such serious pathological changes appear that the cases may prove fatal.

Prevention of TNT poisoning is best summed up by Dr. Alice Hamilton as follows:

"The knowledge that the main absorption occurs through the skin of the hands indicates three lines of action, namely: (1) keeping clean all that the hands can touch; (2) protecting the hands; (3) detecting those hands which are permeable and keeping the owners away from TNT work."

Clothing must be designed to protect the body from the TNT dust. For women workers the bloomers with the legs extending down over high shoes or boots and tied tightly at the bottom should replace skirts.

Low shoes should never be worn. The working clothes must be kept apart from the home clothing. Washing of the hands and face with a solvent, such as a mixture of the oxylenes, has been advocated. Again, applying protective varnishes, such as the "casein varnish" to the skin at the beginning of the day's work and removing it at the end of the day, has given excellent results. Among the best preventive measures are the constant medical supervision of the workers in order to early detect and remove the susceptible persons, and the plan

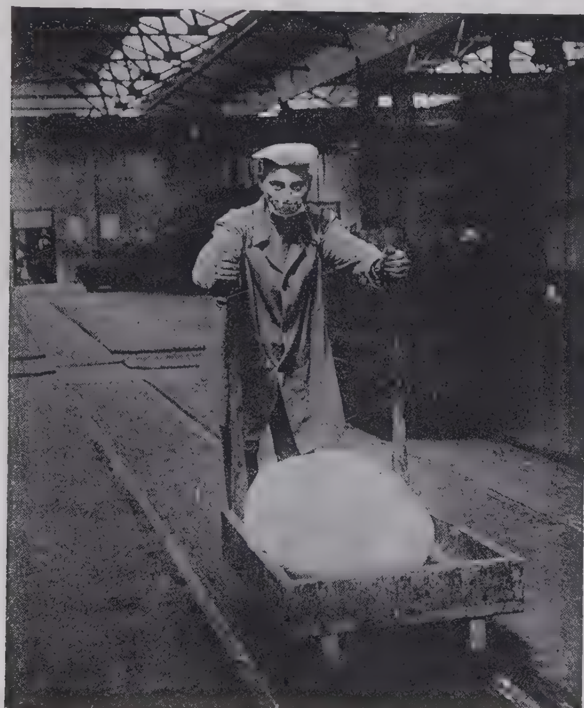

FIG. 38.—A TNT factory in England.

of alteration of labor whereby TNT workers work part time at the hazardous occupation and part time at other work, preferably out of doors. Considerable objection to the alteration method has been raised because of the increased number of persons exposed to TNT poisoning, and the decreased efficiency which results from lack of skill on the part of many of the force.

Treatment consists of removing these patients at once from the hazardous occupation, freeing the hands, hair, clothing, and all other things which come in contact with the person from the TNT dust. It is always preferable to treat such patients in a hospital. These early day treatments are the most important and it is during this

stage that the poison can be eliminated. Fresh air, fresh vegetables, soda bicarbonate and other alkalies are indicated, for there is always an acidosis present. The bowels must be kept open by purgatives and the kidneys flushed by normal salt solutions per rectum or other saline mixtures. No patient, once subject to TNT poisoning, should be allowed to remain at this work.

Fertilizers and Artificial Manures.—All grinding of phosphorite and superphosphates must be done automatically in closed apparatus. Hydrochloric acid is evolved in dissolving the phosphorite with sulphuric acid and it must be exhausted by acid proof fans. The German Imperial Regulations for all manipulations of basic slag which follow furnish an admirable model:

1. Workrooms in which basic slag is crushed, ground, or stored shall be roomy and so arranged as to ensure adequate change of air. Floors shall be of impervious material allowing of easy removal of dust.

2. Preliminary breaking of the slag by hand shall not be done in the grinding rooms, but either in the open air or in open sheds.

3. Slag crushers, grinding mills, and other apparatus shall be so arranged as to prevent escape of dust as far as possible into the workrooms. They shall be provided with exhaust ventilation and means for collecting the dust if this cannot be done in the absence of dust.

4. Arrangements shall be made whereby barrows conveying material to the grinding mills shall be emptied directly into partially hooded hoppers provided with exhaust ventilation so as to prevent escape of dust into the workrooms.

5. The casing and joints of the grinding mills, ducts, dust collectors and sieves shall be airtight; if leaks are noticed they must be repaired forthwith.

6. Ducts, dust collectors and sieves shall be so arranged as to enable periodical cleansing to be undertaken from the outside.

7. Repairs of the plant mentioned in Par. 5 in which workers are exposed to inhalation of slag dust shall be intrusted by the occupier only to such workers as wear respirators supplied for the purpose or other means of protecting mouth and nostrils such as wet sponges, handkerchiefs, etc.

8. Emptying of slag powder from the grinding mills and dust collectors and transference to the store rooms shall only be done in accordance with special regulations designed to minimize dust.

9. Filling slag powder into sacks from the outlets of the mills, elevating and discharging it into receptacles shall only be done under efficient exhaust ventilation.

10. Sacks in which the powder is transported and piled in heaps shall be of a certain defined strength to be increased in the case of sacks to be piled in heaps more than 3½ meters in height. Special

rooms separated from other workrooms shall be provided for storage of slag powder in sacks. Only the sacks representing the previous day's production may be stored in the grinding rooms.

Basic slag in powder and not in sacks shall be kept in special storage rooms shut off entirely from other workrooms. No person shall enter such storage rooms when they are being filled or emptied. Discharging the contents of the sacks into them shall be done under exhaust ventilation.

11. The floors of the workrooms described in Par. 1 shall be cleaned before the commencement of each shift or in an interval during each shift. No person except those engaged in cleaning shall be present during the operation. If cleaning is effected by sweeping, the occupier shall require the persons doing it to wear the respirators provided or other protection for the mouth and nose.

12. The occupier shall not permit the workers to bring spirits into the factory.

13. A lavatory and cloak room and, separated from them and in a part of the building free from dust, a meal room shall be provided. These rooms shall be kept clean, free from dust, and be heated during the winter.

In the lavatory and the cloak room, water, soap and towels shall be provided and adequate arrangement shall be made for keeping the clothing taken off before commencing work. The occupier shall give the persons employed opportunity to take a warm bath daily before leaving work in a bath room erected inside the factory and heated during the winter.

14. No woman or male young person under eighteen years of age shall work or remain in a room into which basic slag is brought.

Persons under eighteen years of age shall not be employed in beating sacks which have contained basic slag.

15. No person employed in breaking or grinding, emptying, packing, or storing basic slag, shall work more than ten hours daily.

There shall be intervals during working hours amounting in the aggregate to two hours, one of them lasting at least an hour. If duration of employment daily is limited to seven hours with never longer than four hours work without an interval, only one interval of at least one hour is required.

16. For work mentioned in Par. 15, no person shall be employed without a certificate from an approved surgeon stating that he is free of disease of the lungs and not alcoholic. The occupier shall place the supervision of the health of the workers under a surgeon who shall examine them at least once a month for signs of disease of the respiratory organs and for alcoholism. Workers engaged in the operations mentioned in Par. 15 shall be suspended from employment when the

surgeon suspects such illness or alcoholism. Those showing marked susceptibility to the effect of basic slag dust shall be permanently suspended.

17. A health register shall be kept in which shall be entered the precise employment, duration of work, and state of health of the persons employed.

18. The occupier shall obtain a guarantee from the workers that no alcohol or food shall be taken into the workrooms.

Fumes given off in the preparation of hydrofluoric acid must be collected in leaden coolers and that which escapes requires to be absorbed by a water spray in the towers. The apparatus must be impervious and kept under a slight negative pressure.

Chromium Compounds.—In Austria, Germany and England suitable provisions are in force for the prevention of chrome ulceration and other affections caused by contact with chromates in such occupations as those in bichromate works, chemical factories, dyeing, tanning, and wood staining, calico and wall paper printing, painting, etc. These provisions require that dust producing processes must be carried on away from the general workrooms; chromates must be crushed in hermetically sealed apparatus as far as possible; working clothes, caps, and respirators must be supplied to employees. They must also be provided with soap, towels, nail brushes, bathing facilities, cloak rooms and lunch rooms. Every employee must furnish a certificate stating that he has no skin disease or open wounds. Daily examinations of the hands and arms is enjoined. Monthly medical examinations are also required and any employee presenting signs of chrome poisoning or ulceration is suspended until free from this. Rules for personal hygiene are posted; smearing the skin with oil or vaseline is recommended. The use of impervious gloves is necessary in some processes. By the English law foremen are required to report to their managers the names of workers failing to comply with the rules for personal hygiene.

Petroleum and Benzin.—Crude petroleum and the fractions first distilled from it affect the skin injuriously. Wetting of the skin should be avoided and careful cleansing enjoined. Those exposed to the gases escaping from oil wells should be provided with "smoke helmets." Petroleum tanks should be thoroughly aired before they are cleaned and they should be entered only by workers equipped with bathing apparatus. Apparatus such as used in the rubber industry and in chemical cleaning establishments containing petroleum or benzin should be airtight. The prevention of poisoning from fumes of benzol or benzin lies in adequate ventilation so that the fumes are so diluted as to be harmless even to those who have a special susceptibility to their action. Artificial ventilation with air exhaust

preferably with a down draft (since these fumes are heavy) must be installed where concentrated fumes are evolved. Specially susceptible persons must be excluded from any industries involving the extensive use of benzin. The substitution of carbon tetrachlorid or other less poisonous substances for benzin can be effected in many processes.

Phosphorus.—Since the use of white phosphorus in making matches has been prohibited in the United States since July 1, 1913, no detailed description of hygienic regulations in this trade are necessary. The danger of poisoning exists also in the extraction of phosphorus, in the production of coal tar dyes, and the making of phosphor bronze. The number of workers exposed in these processes is very small. The ordinary precautions previously described governing the handling of toxic substances should be applied here.

Carbon Bisulphid.—England forbids work longer than five hours a day in rooms where carbon bisulphid is being used in vulcanizing rubber, and no food may be eaten there. Employees must be examined monthly and records kept of such examinations. In Germany[1] since March 1, 1902, more exacting methods are in force with provision for special ventilators, devices to prevent the escape of fumes, cloak room and washing facilities, and monthly examination. Provisions for preventive methods by the various rubber works in America vary greatly, some being very thorough. The same care should prevail also in the other industries in which carbon bisulphid is used, *e.g.*, in preparation of cellulose for artificial silk and in cleaning establishments. In various extracting processes and in vulcanizing, from a hygienic standpoint, benzin, chlorid of sulphur or carbon tetrachlorid are much to be preferred to carbon bisulphid.

Production of Tar, Coke, and Gas.—Imperviousness of the working system of the illuminating gas factory especially of the retorts and correct regulation of pressure is absolutely necessary to prevent needless loss of life through gas poisoning. Special precautions are furthermore necessary in operations with gas purifying materials which so often contain cyanogen. These consist in carrying off injurious gases by suitable ventilating apparatus and their condensation without discharging them into the atmosphere so as to be a menace to health in the vicinity. "Quenching" the coke also removes obnoxious fumes. The same regulations in regard to rendering all apparatus airtight and sufficiency of exhaust, apply to coke ovens. They also apply to the distillation of washing oils.

Power Gas Works.[2]—The following regulations from the Austrian Ministerial Decree of December 2, 1903, cover the important considerations.

[1] Rambousek: "Industrial Poisoning," p. 271.

[2] Rambousek: "Industrial Poisoning," p. 277.

In mixed gas installations (Dowson, water gas) of the older system, the way in which the gas is produced causes the whole apparatus and pipes to be under slight negative pressure, because the steam required for the process must be blown into the generator. In these works, therefore, a small special steam boiler is required, also a gas receiver to store the gas.

In more modern suction generator gas installations the piston is used to suck in steam and air as well as the gases arising in the generator and to draw them into the motor cylinder. Thus the whole system is kept in a condition of slight negative pressure during the process. While the suction generator gas system is working, only so much gas is produced as the motor uses for the time being, so that with this system there is no greater store of gas than is requisite.

In such an installation the following rules should be borne in mind:

1. All the apparatus (gas pipes, valves, etc.) must be constructed and maintained in a completely impervious condition. Any water seals especially which may be in use must receive attention.

2. Precautions must be taken to prevent the gases from the generator passing into the coolers and purifiers when the engine is at rest.

3. Care is to be taken when the apparatus is at rest to prevent any possible subsequent escape of gas into the room where the apparatus is installed.

4. The return of explosive gas out of the gas engine into the gas pipe by failure to ignite or other accident, must be made impossible.

5. The apparatus through which the generator is charged must possess a tightly fitting double valve to prevent escape of gas into the room during charging.

6. The pipes for conducting away the unpleasantly smelling bituminous constituents in the water mixed with sulphuretted hydrogen from the scrubbers must not communicate with the workroom.

7. Precautions must be taken to minimize the danger during the cleaning of the generator (removal of ashes and slag).

8. All stop-cocks and valves are to be so arranged that their position at any time (open or shut) is clearly visible from the outside.

9. Purifiers with a capacity greater than 2 cubic meters must be provided with applicances which make possible thorough removal of gas before they are opened.

10. The gas washing and cleaning apparatus and pipes are to be fitted with gauges indicating the pressure existing in them at any moment.

11. When a suction gas plant is first installed and also at those times when there is no gas in the pipes and plant between the generator and the engine, gas must be blown in until all air is expelled before the engine is set going.

12. During the cleaning of apparatus and pipes which, when in action, contain gas, the rooms must be thoroughly ventilated.

13. Rooms in which suction gas plant is installed must be of such a height that all the plant and its connections can be easily reached for cleaning, etc., and be capable of such free ventilation as to render impossible an accumulation of gas.

14. These rooms must be separated from living rooms by a wall without any openings in it. Emanations also must be prevented as far as possible from entering into living or working rooms situated over the gas engine.

15. Erections of apparatus for generating and purifying suction gas in cellars shall only be allowed if specially effective ventilation is provided by natural or mechanical means.

Acetylene Gas.—The Prussian Ministerial Decree of November 2, 1897, establishes the following regulations regarding workers in acetylene gas installations:

1. Preparation and condensation of acetylene on the one hand, and liquefaction on the other, must be carried on in separate buildings.

2. If the pressure employed for condensation of the gas exceeds eight atmospheres, this work must take place in a room set apart for the purpose.

3. Rooms in which acetylene is prepared, condensed, or liquefied shall not be used as, nor in direct connection with, living rooms. They must be well lighted and ventilated.

4. The carbide must be kept in closed watertight vessels, so as to ensure perfect dryness and only such quantities shall be taken out as are needed. The vessels must be kept in dry, light, well ventilated rooms; cellar rooms may not be used for storage purposes.

5. Crushing of carbid must be done with the greatest possible avoidance of dust. Workers are to be provided with respirators and goggles.

6. Acetylene gasometers must be fitted up in the open air or in a well ventilated room separated from the gas generator. Every gas receiver must have a water gauge showing the pressure in the receiver.

7. Between the gasometer and receiver a gas purifier must be provided so as to remove impurities (phosphoretted hydrogen, arseniuretted hydrogen, carbon bisulphid, ammonia, etc.)

8. Condensation of acetylene gas at a pressure exceeding ten atmospheres shall only be done in combination with cooling.

Ammonia.—In the production of ammonia and ammonium salts the combination of ammoniacal vapors with sulphuric acid gives rise to dangerous gases among them some containing sulphuretted hydrogen cyanogen compounds. The same rules as to imperviousness

and exhaust ventilation as in other chemical processes above mentioned should be enforced.

Tar Products.—Tar products from coal tar distillation necessitate the same precautions. Only cold pitch and asphalt may be stored in open vats, all cooling products being enclosed in "receivers." The injurious gases from the stills containing ammonia and sulphur compounds should be either led into the furnace or subjected to purification by lime or oxid of iron for the recovery of sulphur or ammonia. The following directions are applied since 1904 in England to the distillation of tar for the production of naphtha light oil, creosote oil and pitch.

1. During the process of cleaning, every tar still should be completely isolated from adjoining tar stills either by disconnecting the pipe leading from the swan neck to the condenser worm, or by disconnecting the waste pipe fixed to the worm end or receiver. Blank flanges should be inserted between the disconnections. In addition, the pit discharge pipe or cock at the bottom of the still should be disconnected.

2. Every tar still should be ventilated and allowed to cool before persons are allowed to enter.

3. Every tar still should be inspected by the foreman or other responsible person before any workman is allowed to enter.

4. The inspecting foreman on first entering any tar still or tank, and all persons employed in tar stills or tanks in which there are no cross stays or obstructions likely to cause entanglement, should be provided with a belt securely fastened around the body with a rope attached, the free end being left with two men outside whose sole duty should be to watch and draw out any person appearing to be affected by gas. The belt and rope should be adjusted and worn in such a manner that the wearer can be drawn up head foremost and through the manhole and not across it.

5. A bottle of compressed oxygen, with mouthpiece, should be kept at all times ready for use; and printed instructions as to the use of this bottle, and the method to be employed for resuscitation by means of artificial respiration should be kept constantly affixed. A draft of such instructions is appended.

6. A supply of suitable chemical respirators properly charged and in good condition should be kept ready for use in case of emergency arising from sulphuretted hydrogen or certain poisonous gases. (Granules of carbon saturated with a solution of caustic soda readily absorb sulphuretted hydrogen and may be used for charging respirators.)

7. The use of naked lights should be strictly prohibited in any portion of the works where gas of an inflammable nature is liable to be given off.

8. Each still should be provided with a proper safety valve which should at all times be kept in efficient working condition.

Gassing. *Symptoms.*—The first symptoms are giddiness, weakness in the legs, and palpitation of the heart. If a man feels these he should at once move into fresh warm air, when he will quickly recover if slightly affected. He should avoid exposure to cold. He should not walk home too soon after recovery; any exertion is harmful.

First Aid.—Remove the patient into fresh warm air. Send for the oxygen apparatus. Send for a doctor. Begin artificial breathing at once if the patient is insensible and continue it at least for half an hour, or until natural breathing returns. Give oxygen at the same time and continue it after natural breathing returns.

Artificial Breathing (*Schafer Method*).—Place the patient face downward. Kneel at the side of the patient or astride of him and place your hands flat in the small of his back with thumbs nearly touching, and the fingers spread out on each side of the body over the lowest ribs.

Then promote artificial breathing by leaning forward over the patient and, without violence, produce a firm, steady, downward pressure. Next release all pressure by swinging your body backward without lifting your hands from the patient.

Repeat this pressure and relaxation of pressure without any marked pause between the movements, about fifteen times a minute, until breathing is established.

Use of Oxygen Cylinder.—Open the valve gradually by tapping the lever key (which must first be extended to its full length) with the wrist until the oxygen flows in a gentle stream from the mouthpiece into the patient's mouth. The lips should not be closed around the mouthpiece. The nostrils should be closed during breathing in, and opened during breathing out.

If the teeth are set, close the lips and one nostril. Let the conical end of the mouthpiece slightly enter the other nostril during breathing in, and remove it for breathing out.

Coal Tar Colors and Organic Dye-stuffs.—Much has been done in the last few years to clear up the misconceptions as to the dangers attending the production of anilin and other coal tar colors. The raw products themselves, benzin, toluidin, etc., produce the greatest number of poisonings. The manufacture of the intermediate groups[1] especially nitro compounds is also dangerous. The subsidiary substances, especially chlorin and other acids are injurious. In purifying the raw material, *e.g.*, benzin, distillation and cooling apparatus

[1] Grandhomme: "Weyls Handb. d. Arbeiterkrankh.," Jena, 1908 p. 104. Curschmann: "Actes deu II Congress Internat des Maladies Profession elles Brussels," 1910.

must be impervious. Dangerous solvents such as pyridin must be used in closed chambers. In the nitrating operations poisonous nitrous fumes escape, while arseniuretted hydrogen escapes when reduction is accomplished by means of tin and sulphur dioxid or sulphuretted hydrogen in sulphonating unless the apparatus is tightly closed. These injurious fumes should be burned, neutralized, or absorbed and disposed of. The contact of workers with the poisonous anilin is difficult to avoid entirely and the general rules for personal hygiene for chemical workers must be scrupulously obeyed.

The dangers arising from poisonous dusts in dye works have been mentioned under injurious dusts.

PREVENTIVE MEASURES IN SMELTING AND METAL HANDLING TRADES

When furnaces leak because the walls are not airtight and proper negative pressure is not maintained injurious gases, principally carbon monoxid, sulphur dioxid and hydrocarbons escape. Entering flues for cleaning or repairing should be done only by those equipped with breathing apparatus. In roasting operations furnaces are now largely worked mechanically. The use of chlorin compounds in extraction of metals such as silver or copper from ores causes the evolution of chlorin and hydrochloric fumes which should be absorbed in special towers while metallic fumes should be dealt with by special condensers and ventilators.

Iron.—The use of a cupola bell opened at intervals mechanically when charging is necessary, allows the poisonous but valuable gases from the blast furnace to pour out, be conducted away, and utilized. The gases, the most dangerous of which is perhaps sulphuretted hydrogen, which escapes during tapping and slag running should be collected by hoods and carried off. In the blowing operation by the Bessemer process the dark smoke arising out of the converter should be drawn off by flues.

In the transport of ferrosilicon the following police regulations of the Prussian Minister of Trade (September 29, 1910) are valuable:

1. The ferrosilicon must be packed in watertight cases of wood or metal.

2. On the cases must be inscribed legibly and indelibly "Ferrosilicon. To be kept dry. With care."

3. It must be delivered dry and in dry cases.

4. The cases must be stored in airy places (on the boat) protected from the wet.

Dr. Copeman[1] as a result of his inquiry in the cases of poisoning

[1] On the Nature, Uses, and Manufacture of Ferrosilicon, 1909.

on the steamer Aston has suggested the following regulations which should be made international:

1. Ferrosilicon should not be sent out from the works immediately after manufacture, but after being broken up into pieces of the size in which it is usually sold, should be stored under cover, but exposed to the air as completely as possible, for at least a month before being dispatched from the works.

2. Manufacturers should be required to mark in bold letters each barrel or other parcel of ferrosilicon with the name and percentage grade (certified by chemical analysis) of the material; the name of the works where it is produced; the date of manufacture and date of dispatch.

3. The carriage of ferrosilicon on vessels carrying passengers should be prohibited. When carried on cargo boats it should, if circumstances permit, be stored on deck. If it be considered necessary to store it elsewhere the place of storage should be capable of being adequately ventilated, and such place of storage should be cut off by airtight bulkheads from the quarters occupied by the crew of the vessel.

4. This regulation should apply to the transport of ferrosilicon on river or canal barges as well as on sea-going vessels.

5. Storage places at docks or at works where ferrosilicon is used should have provision for free access of air, and should be situated at a distance from workrooms, mess rooms, offices, etc.

Lead.—All measures both personal and general which have been mentioned in the general discussion of the prevention of industrial poisoning should be put into practice in the protection of the worker against the most widespread of all slow industrial poisonings. Personal hygiene is as important as proper factory conditions. Workers in lead should be carefully selected under medical supervision and all should be excluded who present signs of any disease which, associated with plumbism, would be especially dangerous, such as all forms of tuberculosis, alcoholism, epilepsy, hysteria or any other tendency to mental diseases, "rheumatism," or diseases of the kidney or cardiovascular apparatus. Women and young persons should be excluded from such work. Alternation of employment and short working hours are especially beneficial to workers exposed to the danger of plumbism.

The early diagnosis of lead poisoning is best accomplished by periodic examination of employees and on the appearance of the first signs they should be transferred to some other work.

Suitable nourishing food and avoidance of alcohol are of prime importance.

In a number of cases substitution is impractical but wherever possible non-poisonous or less poisonous substitutes should be used in-

stead of lead; for example, the substitution of carborundum for lead discs in polishing precious stones, leadless glaze in potteries in place of lead glaze, beds free of lead in various industries instead of lead beds. The attempts to find suitable substitutes for lead colors, particularly white lead, have thus far not been rewarded with entire success.

Attempts have been made to introduce soaps containing alkalin sulphids into the lead industries for use in the lavatories for the purpose of converting the soluble lead on the worker's skin into the comparatively insoluble black lead sulphid.

The type of regulation by the governments of continental European countries is well exemplified by the following:

Decree of the President of the French Republic (April 23, 1908) relating to certain industries in which lead is used

1. In the lead industries hereinafter mentioned, viz.: smelting, cupellation of argentiferous lead, manufacture of accumulators, glass-making, manufacture and use of lead enamels, manufacture of pottery, decoration of porcelain or faience, ceramic chromo-lithography, manufacture of lead alloys, oxids, salts and colors, employers, directors or managers are required, apart from the general measures prescribed by the Decree of the 29th of November, 1904, to take special measures for protection and health as set forth in the following sections.

2. Lead melting pots shall be erected in an airy place separated from the other workrooms.

Hood or other means for the effectual removal of fumes shall be provided:

(*a*) Over the openings for the run of lead and slag in lead smelting.

(*b*) Before the furnace doors in the manufacture of lead oxids.

(*c*) Above the pots for melting lead or its alloys, in the other industries enumerated in section 1.

3. All work with oxids and other compounds of lead capable of producing dust shall be done as far as possible when in a damp condition.

When this work cannot be done in the presence of water or other liquid, it shall be carried out by mechanical means, in covered airtight apparatus.

If it is impossible to conform to the requirements of either of the first two paragraphs of this section, the work shall be done under a strong draught so arranged that the harmful products may be intercepted by apparatus suitably placed.

Finally, if none of these systems is possible the workmen shall be supplied with respirators.

4. Oxids and other compounds of lead, whether dry or damp, in suspension or solution, shall not be handled with the bare hands. The employer shall at his own expense provide the workers in these operations with either gloves made of impervious material such as india rubber, or suitable appliances, and shall cause them to be kept in good repair and frequently cleaned.

5. Tables on which these products are handled shall be covered with some impervious material, kept in a perfectly watertight condition.

The same requirement applies to the floors of the workrooms which shall also be kept damp.

The floors shall be slightly sloped toward a watertight receptacle for collecting the lead substances which are washed down.

The work shall be so arranged that there shall be no splashing. The tables, floors and walls shall be washed at least once a week.

6. Without prejudice to the requirements of Section 3, the grinding and mixing of lead products, and the use of them in dusting shall be effected in special places with active ventilation.

If the materials cannot be damped, the workers shall be provided with respirators.

7. Pottery shall not be dipped with bare hands in solutions containing litharge, red lead, galena or white lead in suspension.

8. No food or drink shall be brought into the works.

9. Employers shall, at their own expense, provide and maintain for the use of the workers, overalls or clothing for use during work only, in addition to gloves and respirators.

10. In a part of the building separated from the workrooms, there shall be provided for the use of the workers exposed to lead dust or fumes, a cloak room and lavatory kept in good order, provided with basins or taps in sufficient number, a plentiful supply of water, soap and a towel for each worker replaced at least once a week.

The cloak room shall be provided with cupboards or drawers with locks or padlocks the ordinary clothing being kept apart from the working clothes.

11. A warm bath or shower bath shall be provided each week for the workers exposed to lead dust or fumes.

A warm bath or shower bath shall be provided every day after work, for each worker employed, either in emptying or cleaning the condensing chambers and flues, in repairing furnaces in lead works, in carrying lead corrosions from the bed in white lead factories, in packing red lead, in grinding lead enamels and in dry dusting.

12. Employers are required to exhibit, in a conspicuous position

in the works, regulations imposing on the workers the following obligations:

To use the appliances, gloves, respirators, and working clothes placed at their disposal.

Not to bring into the works either food or drink.

To pay great care before each meal, to the cleanliness of the mouth, nose and hands.

To take the baths weekly or daily as provided in Section 11.

13. The Minister of Labor may, by order made with the advice of the Consultative Committee for Arts and Manufactures, exempt an establishment for the specified period from all parts of the requirements of Regs. 2, 5 and 6 in any case where it is found that observance of these requirements is practically impossible, and that the health and safety of the workers are assured by conditions at least equivalent to those prescribed in the present Order.

14. Subject to additional postponements which may be granted by the Minister in pursuance of Section 6 of the Act of 12th June, 1893 (as amended by that of 11th July, 1903), the delay required for the carrying out of the alternations necessitated by the present decree is limited to one year from the date of its publication.

15. The Ministry of Labor is charged with the administration of this Decree.

This Decree was supplemented by further noteworthy additions requiring medical supervision in lead industries as follows:

Decree of December 28, 1909, Organizing Medical Service in Industries Exposing the Workers to risk of Lead Poisoning

1. In premises in which the processes enumerated in Regulation 1 of the Decree of April 23, 1908, are carried on medical attendance as prescribed below shall be provided.

2. A surgeon appointed by the occupier shall examine the workers and enter the results of examination required in Regulations 3 and 4. The examinations shall be paid for by the occupier.

3. No person shall be employed in work mentioned in Regulation 1 of the Decree of April 23, 1908, without a certificate from the surgeon stating that he is free from symptoms of lead poisoning and of illness which might render him specially susceptible.

4. No worker shall remain at the same employment unless the certificate is renewed one month after commencement of employment and subsequently at quarterly intervals.

In addition to the periodical examination, the occupier shall give an order on the surgeon to every workman declaring himself to be ill from his employment or who desires to undergo medical examination.

5. A special Register open to the Factory Inspector shall be kept containing the following particulars of each worker:

(1) Dates and duration of absence on account of illness of any kind.

(2) Dates of medical certificates for such illness, the notes made by the surgeon and the name of the surgeon furnishing them.

(3) Instructions given by the appointed surgeon in pursuance of Regulations 3 and 4 above.

Lead Smelting.—All flues, furnaces and other apparatus in this industry should be as airtight as possible and efficient exhaust ventilation should be provided wherever lead dust or fumes are generated. Lead smelting even under the most propitious circumstances is a dangerous occupation and personal hygiene among workers must be encouraged in every way possible. The following instructions for smelters are issued by the Institute for Industrial Hygiene of Frankfurt.

How does lead poisoning arise?

The danger of lead poisoning in lead, spelter and other smelting premises can be avoided if due care is observed.

Lead poisoning occurs when lead enters the system. This takes place by breathing dust and fumes containing lead, or by eating and drinking, smoking, snuff taking and tobacco chewing if food or tobacco is taken into the mouth with dirty hands and dirty face and beard.

No one is immune from lead. Lead accumulates in the body of careless persons and he who is not sick to-day can be so to-morrow or after weeks or months.

How can plumbism be avoided?

All smelters must observe cleanliness. In this respect they should see to the following points:

1. It is to their interest to see that the exhaust ventilation is kept in order and that the special rules or regulation are exactly followed. Further, special clothing should be worn, the mouth and nose should be covered, and the floors sprinkled.

2. It is especially important that in intervals and at the close of work the mouth, face, beard, and hands should be carefully cleaned. Food should not be eaten or the premises left without putting on fresh clothes and thoroughly washing or, still better, bathing. When drinking, the edge of the drinking glass should not be fingered with dirty hands. Especially important is it that the teeth should be cleaned and the mouth washed out.

3. During work smoking, snuff taking, and tobacco chewing, which invariably convey lead into the mouth, should be given up, as it is impossible to prevent the hands getting contaminated with lead.

Lighting the pipe with glowing lead ashes is in the highest degree dangerous from the risk of inhaling lead fume. The body must be strengthened to withstand the action of lead. Moderation in drinking, especially avoidance of spirits, should be observed. Alcoholic subjects succumb to lead poisoning much more readily than the temperate.

Food should be abundant and rich in fat, for example, milk and bacon. Thick soups are excellent before work. Work should never be begun on an empty stomach. And lastly, as much fresh air as possible. Walking athletics, work in the garden and field will help to keep off many an attack. If anyone thinks that he is suffering from lead poisoning he should at once in his own and in his family's interest see the doctor of his sick club.

The following rules are noteworthy:

German Imperial Regulations for Lead Smelting Works Dated June 16, 1905

GENERAL REGULATIONS

1. Workrooms in which lead ores are roasted, sintered, or smelted, pig lead produced and submitted to further treatment, distillation of rich lead (bullion cupellation) litharge, red lead, or other oxids of lead prepared, ground or sieved, stored or packed, or zinc skimmings distilled, shall be roomy, high, and so arranged that a sufficient constant exchange of air takes place. They shall be provided with a level and solid floor to allow of easy removal of dust by a moist method.

The walls shall be smooth so as to prevent collection of dust; they shall be either washed down or lime washed at least once a year.

Provided that this shall not apply in the case of calcining sheds with woodened walls.

2. An abundant supply of good drinking water, protected against contamination from dust, shall be provided for the workers on the furnaces and smelting pots, and in such close proximity to them that they can obtain it at any time without having to go into the open air.

Arrangements for sprinkling the floors shall be provided near the furnaces. The floors of the rooms mentioned in paragraph 1 shall be wet cleansed at least once daily.

3. Prepared (*i.e.*, concentrated) lead ores and leady smelting products, unless moist, shall not be crushed except in an apparatus so arranged as to prevent as far as possible penetration of dust into the workrooms.

Provided that this shall not apply to calcined material from converters.

Sacks in which lead ores and materials containing lead have been

packed shall not be freed from dust and cleaned except in a dust proof apparatus or by washing.

4. Materials containing lead for charging the blast furnaces, if they are oxids and form dust, shall be damped before they are mixed with other materials, stocked on the feeding floor, or charged into the blast furnaces.

5. Dust, gases, and lead fumes, escaping from furnaces, converters, tapping spouts, tapping pots, drain sump, slag pots, slag cars, or slag channels, and from glowing residues taken from the furnaces, shall be caught as near as possible to the point of origin and removed harmlessly.

Dust collecting chambers, flues, as well as furnaces which have been "blown down," shall not be entered by workmen unless sufficiently cooled and ventilated.

SPECIAL REGULATIONS FOR SUCH PARTS OF A FACTORY WHERE LEAD COLORS ARE PREPARED

6. In grinding, sieving and packing dry leady materials, in charging, and empying litharge and red lead furnaces, in collecting the red lead and similar operations in which leady dust is developed, exhaust arrangement shall be provided for preventing the entrance of dust into the workrooms.

7. Apparatus producing leady dust if their construction and manner of use does not effectually prevent evolution of dust, shall have all cracks protected by thick layers of felt or woolen material, or by similar means, so as to prevent the entrance of dust in to the workrooms.

Apparatus of this character shall be provided with arrangements for preventing compression of air in them. They shall only be opened when the dust in them shall have completely settled, and they are absolutely cool.

SPECIAL ARRANGEMENTS IN FORCE FOR THE DISTILLATION OF ZINC SKIMMINGS

8. Proposed new furnaces for the distillation of zinc skimmings (for which according to Paragraphs 16 and 25 of the Industrial Code a special permission is required) shall be so arranged that (1) there shall be at least a clear space of ten feet in front of the charging opening; (2) any passages under the distillation rooms shall be roomy, at least 11½ feet high in the center, light and airy.

9. Dust, gases, and fumes arising from the zinc skimmings distillation furnaces shall be collected as near as possible to the point of origin, and carried outside the smelting room.

The entrance of gases from the fires into the smelting room shall be prevented as far as possible by suitable arrangements for drawing them off.

10. Sieving and packing of by-products obtained in the distillation of zinc skimmings (poussiére, flue dust) shall not be done except in a special room separated from the other workrooms, and complying with the requirements of Regulation 1.

Sieving shall only be done in an apparatus so constructed that dust shall not escape.

EMPLOYMENT OF WORKERS

11. Women and young persons shall not be employed or permitted in rooms mentioned in Regulation 1, in flue dust chambers, or dust flues, or in the removal of flue dust.

12. No person shall be newly employed in rooms mentioned in Regulation 1, in flue dust chambers, or dust flues, or in the transport of flue dust, without a certificate of fitness from the surgeon appointed by the higher authorities.

These certificates shall be collected and shown to the Factory Inspector and Appointed Surgeon on request.

13. No person shall be employed in charging blast furnaces apart from mere laboring work on the floors, for more than eight hours daily. The same shall apply in the case of workmen employed in the inside of furnaces when cool, or in emptying flue dust chambers, or dust flues which contain wet flue dust.

No person shall be employed in cleaning out from inside flue dust chambers, or dust flues containing dry flue dust for more than four hours daily; and including emptying and work of transport of this kind altogether no longer than eight hours daily.

Other workers in rooms specified in Regulation 1 shall not work more than ten hours in twenty-four, exclusive of meal times.

Exception to this is allowed in the case of those workers who are employed for the purpose of weekly change of shift, and for whom exception as to Sunday employment is permitted by Imperial Decree.

CLOTHING, OVERALLS, LAVATORY ACCOMMODATIONS, ETC.

14. The occupier shall provide for all persons employed in cleaning out flue dust chambers, dust flues, repairing of cooled furnaces, grinding, sieving and packing of litharge, red lead, or other lead colors, complete suits of working clothes, including caps and respirators.

15. Work with lead salts in solution shall not be done except by workers who either grease their hands or are provided with impermeable gloves.

16. The suit of clothes, or overalls, provided in Regulations 14 and 15, respirators and gloves, shall be provided in sufficient amount and in proper condition. The occupier shall see that these are always suitable for their purpose, and are not worn except by those workers

for whom they are intended; and that they, at stated intervals (the overalls at least once a week, the respirators and gloves prior to use), are cleaned, and during the time that they are not in use are kept in a place specially reserved for each article.

17. A lavatory and cloak room shall be provided for the use of the workman in a part of the building free from dust. Separate from it there shall be a dining room. These rooms must be kept free from dust and be warmed during the winter.

In a suitable place provision shall be made for warming the workers' food.

Water, soap, and towels, and arrangements for keeping separate the overalls from other clothing taken off before the commencement of work shall be provided in sufficient amount in the lavatory and cloak room.

The occupier shall afford opportunity for persons engaged in cleaning out flue dust chambers, dust flues, and the cooled furnaces, to take a bath daily after the end of the work, and for those handling oxids of lead, at least once a week, during working hours inside the works. The bath room shall be warmed during the winter.

18. The occupier shall place the supervision of the health of the workers in the hands of a surgeon appointed by the higher authorities for this purpose, whose name shall be sent to the Inspector of Factories. The surgeon shall examine the workers at least once a month in the factory, with a view to the detection of symptoms of lead poisoning.

The occupier shall not employ persons suspected by the surgeon of having contracted lead poisoning in the processes mentioned in Regulation 1 or in cleaning out flue dust chambers, dust flues, or furnaces when cold, or transport of the flue dust, until they are quite well. Those who appear peculiarly susceptible shall be permanently suspended from working in these processes.

19. The Health Register shall be shown to the Factory Inspector and Appointed Surgeon on demand. (Similar to Regulation 15 of Smelter Regulations.)

20. The occupier shall require the workers to subscribe to the following condition:

(1) Food must not be taken into the workrooms. Meals may only be taken outside the workrooms.

(2) Workmen must only enter the meal room to take their meals or leave the factory, after they have taken off their overalls and carefully washed their face and hands.

(3) Workmen must use the overalls, respirators and gloves in those workrooms and for the particular processes for which they are given them.

(4) Cigar and cigarette smoking during work is forbidden.

(5) A bath in the factory must be taken every day at the close of their work by those engaged in the emptying and cleaning of flue dust chambers, flues, and furnaces when cold, and by those employed on oxids of lead once a week.

Provided that this shall not apply in the case of workmen exempted by the appointed surgeon.

Workers contraventing these orders will be liable to dismissal without further notice.

21. In every workroom, as well as in the cloak room and meal room, there shall be posted up by the occupier, in a conspicuous place and in clear characters, a notice of these Regulations.

The occupier is responsible for seeing that the requirements of Regulation 20 (1) is obeyed. He shall make a manager or foreman responsible for the precise carrying out of Regulation 20 (1), (2) and (5). The person thus made responsible shall see to the carrying out of the regulation and for the exercise of necessary care as prescribed in Paragraph 151 of the Factory Act.

22. No work in a lead smelting works shall be commenced until notice of its erection has been sent to the Factory Inspector. After receipt of the notice he shall personally visit to see whether the arrangements are in accordance with these regulations.

23. These regulations come into force on the 1st of January, 1906.

Where structural alterations are necessary for the carrying out of Regulations 1, 6 (1), 6, 9, 10 and 17, the higher authorities may allow an extension of time to a date not later than January 1st, 1908.

If it seems necessary on strong grounds of public interest the Council (Bundesrath) may extend the time in particular works until the 1st of January, 1913, and until then allow exceptions from the regulations as regards Regulation 13 (1) and (2).

The following brief synopsis is fairly representative of the English and German regulations for the smelting of metals, tinning of hollow ware, dyeing of yarn with lead chromate, vitreous enameling, and rules for white lead and earthenware.

Definitions.—In these Regulations "lead process" means pasting, casting, lead burning, or any work involving contact with dry compounds of lead.

Any approval given by the Chief Inspector of Factories in pursuance of these Regulations shall be given in writing, and may at any time be revoked by notice in writing signed by him.

Duties of Occupier

1. **Ventilation.**—Every room in which casting, pasting or lead burning is carried on shall contain at least 500 cubic feet of air space

for each person employed therein, and in computing this air space, no height above 14 feet shall be taken into account.

These rooms and that in which the plates are formed shall be capable of thorough ventilation. They shall be provided with windows made to open.

2. **Separation of Processes.**—Each of the following processes shall be carried on in such manner and under such conditions as to secure effectual separation from one another and from any other process.

(*a*) Manipulation of dry compounds of lead.

(*b*) Pasting.

(*c*) Formation and lead burning necessarily carried on therewith.

(*d*) Melting down of old plates.

Provided that manipulation of dry compounds of lead carried on as in Regulation 5 (*b*) need not be separated from pasting.

3. **Floors.**—The floors of the rooms in which manipulation of dry compounds of lead or pasting is carried on shall be of cement, or similar impervious material, and shall be kept constantly moist while work is being done.

The floors of these rooms shall be washed with a hose pipe daily.

4. **Melting Pots.**—Every melting pot shall be covered with a hood and shaft so arranged as to remove the fumes and hot air from the workrooms.

Lead ashes and old plates shall be kept in receptacles especially provided for the purpose.

5. **Manipulation of Dry Compounds of Lead.**—Manipulation of dry compounds of lead in the mixing of the paste or other processes shall not be done except (*a*) in an apparatus so closed, or so arranged with an exhaust draught, as to prevent the escape of dust into the workroom; or (*b*) at a bench provided with (1) efficient exhaust draught, and air guides so arranged as to draw the dust away from the worker. and (2) a grating on which each receptacle of the compound of lead in use at the time shall stand.

6. **Covering the Benches.**—The benches at which pasting is done shall be covered with sheet lead or other impervious material, and shall have raised edges.

7. **Prohibition of Employment.**—No woman, young person, or child shall be employed in the manipulation of dry compounds of lead or in pasting.

8. (*a*) **Appointed Surgeon.**—A duly qualified medical practitioner (in these Regulations referred to as the "Appointed Surgeon") who may be the certifying surgeon, shall be appointed by the occupier, such appointment unless held by the Certifying Surgeon to be subject to the approval of the Chief Inspector of Factories.

(*b*) **Medical Examination.**—Every person employed in a lead process shall be examined once a month by the Appointed Surgeon, who shall have power to suspend from employment in any lead process.

(*c*) No person after such suspension shall be employed in a lead process without written sanction entered in the Health Register by the Appointed Surgeon. It shall be sufficient compliance with this regulation for a written certificate to be given by the Appointed Surgeon and attached to the Health Register, such certificate to be replaced by a proper entry in the Health Register at the Appointed Surgeon's next visit.

(*d*) **Health Register.**—A Health Register in a form approved by the Chief Inspector of Factories shall be kept, and shall contain a list of all persons employed in lead processes. The Appointed Surgeon will enter into the Health Register the dates and results of his examinations of the persons employed and particulars of any directions given by him. He shall on a prescribed form furnish to the Chief Inspector of Factories on the first day of January in each year a list of the persons suspended by him during the previous year, the cause and duration of such suspension, and the number of examinations made.

The Health Register shall be produced at any time when required by H. M. Inspectors of Factories or by the Certifying Surgeon or by the appointed Surgeon.

9. **Overalls.**—Overalls shall be provided for all persons employed in manipulating dry compounds of lead or in pasting. The overalls shall be washed or renewed once every week.

10. **Cloak and Dining Rooms.**—The occupier shall provide and maintain:

(*a*) A cloak room in which workers can deposit clothing put off during working hours. Separate and suitable arrangements shall be made for the storage of overalls required in Regulation 9.

(*b*) A dining room unless the factory is closed during meal hours.

11. **Food, Etc.**—No person shall be allowed to introduce, keep, prepare or partake of any food, drink, or tobacco, in any room in which a lead process is carried on. Suitable provision shall be made for the deposit of food brought by the workers.

This regulation shall not apply to any sanitary drink provided by the occupier and approved by the Appointed Surgeon.

12. **Washing.**—The occupier shall provide and maintain for the use of the persons employed in lead processes a lavatory, with soap, nail brushes, towels, and at least one lavatory basin for every five such persons. Each such basin shall be provided with a waste pipe, or the basins shall be placed on a trough fitted with a waste pipe.

There shall be a constant supply of hot and cold water laid on each basin.

Or, in the place of basins the occupier shall provide and maintain troughs of enamel or similar smooth impervious material, in good repair, of a total length of two feet for every five persons employed, fitted with waste pipes, and without plugs, with a sufficient supply of warm water constantly available.

The lavatory shall be kept thoroughly cleansed and shall be supplied with a sufficient quantity of clean towels once every day.

13. Before each meal and before the end of the day's work, at least ten minutes, in addition to the regular meal times, shall be allowed for washing to each person who has been employed in the manipulation of dry compounds of lead or in pasting.

Provided that if the lavatory accommodation specially reserved for such person exceeds that required by Regulation 12, the time allowance may be proportionately reduced, and that if there be one basin or two feet of trough for each such person this regulation shall not apply.

14. **Baths.**—Sufficient bath accommodation shall be provided for all persons engaged in the manipulation of dry compounds of lead or in pasting, with hot and cold water laid on, and a sufficient supply of soap and towels.

This rule shall not apply if in consideration of the special circumstances of any particular case, the Chief Inspector of Factories approves the use of local public baths when conveniently near, under the conditions (if any) named in such approval.

15. **Cleaning.**—The floors and benches of each workroom shall be thoroughly cleansed daily, at a time when no other work is being carried on in theroom.

Duties of Persons Employed

16. **Medical Examination.**—All persons employed in lead processes shall present themselves at the appointed times for examination by the appointed surgeon as provided in regulation 8.

No person after suspension shall work in a lead process, in any factory or workshop in which electric accumulators are manufactured, without written sanction entered in the health register by the appointed surgeon.

17. **Overalls.**—Every person employed in the manipulation of dry compounds of lead or in pasting shall wear the overalls provided under Regulation 9. The overalls, when not being worn, and clothing put off during working hours, shall be deposited in the places under Regulation 10.

18. **Food, Etc.**—No person shall introduce, keep, prepare, or

partake of any food, drink (other than any sanitary drink provided by the occupier and approved by the appointed surgeon), or tobacco in any room in which a lead process is carried on.

19. **Washing.**—No person employed in a lead process shall leave the premises or partake of meals without previously and carefully cleaning and washing the hands.

20. **Baths.**—Every person employed in the manipulation of dry compounds of lead or in pasting shall take a bath at least once a week.

21. **Interference with Safety Appliances.**—No person shall in any way interfere, without the concurrence of the occupier or manager, with the means and appliances provided for the removal of the dust or fumes, and for the carrying out of these regulations.

The Massachusetts State Board of Health has issued the following protective measures in a publicity campaign against lead poisoning:

"The poison gains entrance into the system:

(1) By swallowing minute particles of lead.
(2) By inhaling lead dust or fumes of lead in a molten state or the vapor of lead in a fused state.
(3) By absorption from the skin in handling lead.

Advice to Employees

1. General personal cleanliness is of first importance.

2. Thoroughly clean your hands before touching food or before leaving the workroom.

3. Thoroughly rinse your mouth before eating.

4. Take a substantial breakfast; an empty stomach is more susceptible to the poisonous effects of lead.

5. Take good nutritious food and plenty of milk.

6. Never eat at your work. Eat your luncheon outside of the workroom away from the lead. Never smoke or use tobacco in any form while at work.

7. Avoid all excesses! Alcoholic beverages are especially injurious.

8. Wear overalls or a long coat at your work; also a cap or some head covering. Wherever practical wear gloves when lead is to be handled.

9. Persons working in white lead or other powdered compounds of lead should always wear respirators while at work. Cause as little dust as possible.

10. Consult a physician at the first sign of ill health.

Advice to Employers

1. Provide washing facilities, lockers, and a place for the employees to eat luncheons away from lead.

2. Provide respirators for all workers who have to handle white lead or other powdered compounds of lead.

3. The floors of the workrooms and the benches at which men work should be cleaned daily after thoroughly moistening them.

4. These regulations should be posted in a conspicuous place in the workrooms."

White Lead.—The processes in the production of white lead which create dust are the most dangerous. Chambers should only be emptied by men wearing respirators. Vacuum cleaning apparatus should be used to clean all dusty apparatus. Drying stoves should as far as possible be mechanically charged. Similar measures should be employed in the production of red lead, and lead chromates.

The Painters Trade.—The painters trade in all countries furnishes employment for a larger number of men than any other lead trade. Because the men do not always work in shops but, as in the case of house painters, in the various places where painting must be done it is an especially difficult trade in which to control the working conditions.

The workers themselves sometimes recognize some of the dangers to which they are exposed as is evidenced by the following reasonable demands made by the Brotherhood of Chicago Painters and paperhangers during a strike in April, 1913:

"No workmen or apprentices shall be required to use any poisonous substance or material injurious to health, such as wood alcohol, varnish remover, oxalic acid, or the sanding of lead, etc., unless they are protected with respirators, gloves, etc., same to be furnished by the employer; nor shall they be required to use any dirty or insanitary waste, rags or drop cloths. There shall be an allowance of five minutes for wash time in each four hours' work, and where lead or other poisonous material is used, the employer shall furnish hot water, soap and towels to the workmen. The officers and members of the organization shall enforce this clause."

The German regulations, as quoted by Rambousek, covering the trades of this group are admirable:

I. Regulations for carrying on the Industries of Painting, Distempering, Whitewashing, Plastering or Varnishing.

Regulation—1. In the processes of crushing, blending, mixing and otherwise preparing white lead, other lead colors, or mixtures thereof with other substances in a dry state, the workers shall not directly handle pigment containing lead, and shall be adequately protected against the dust arising therefrom.

Regulation 2.—The process of grinding white lead with oil or varnish shall not be done by hand, but entirely by mechanical means, and in vessels so constructed that even in the processes of charging

them with white lead no dust shall escape into places where work is carried on.

This provision shall apply to other lead colors. Provided that such lead colors may be ground by hand by male workers over eighteen years of age, if not more than one kilogram of red lead and one hundred grains of other lead colors are ground by any one worker in one day.

Regulation 3.—The processes of rubbing down and pumice-stoning dry coats of oil color or stopping, not clearly free from lead, shall not be done except after damping.

All débris produced by rubbing down and pumice-stoning shall be removed before it becomes dry.

Regulation 4.—The employer shall see that every worker who handles lead colors or mixtures thereof is provided with, and wears, during working hours, a painter's overall or other complete suit of working clothes.

Regulation 5.—There shall be provided for all workers engaged in processes of painting, distempering, whitewashing, plastering, or varnishing, in which lead colors are used, washing utensils, nail brushes, soap and towels. If such processes are carried on in a new building or in a workshop, provision shall be made for the workers to wash in a place protected from frost, and to store their clothing in a clean place.

Regulation 6.—The employer shall inform workers, who handle lead colors or mixtures thereof, of the danger to health to which they are exposed, and shall hand them, at the commencement of employment, a copy of the accompanying leaflet (not printed with this edition), if they are not already provided with it, and also a copy of these regulations.

II. Regulations for the Processes of Painting, Distempering, Whitewashing, Plastering, or Varnishing when carried on in connection with another Industry.

Regulation 7.—The provisions of paragraph 6 shall apply to the employment of workers connected with another industry who are constantly or principally employed in the processes of painting, distempering, whitewashing, plastering, or varnishing, and who use, otherwise than occasionally, lead colors or mixtures thereof. The provisions of paragraphs 8 to 11 shall also apply if such employment is carried on in a factory or shipbuilding yard.

Regulation 8.—Special accommodation for washing and for dressing shall be provided for the workers, which accommodation shall be kept clean, heated in cold weather, and furnished with conveniences for the storage of clothing.

Regulation 9.—The employer shall issue regulations which shall be

binding on the workers, and shall contain the following provisions for such workers as handle lead colors and mixtures thereof:

1. Workers shall not consume spirits in any place where work is carried on.

2. Workers shall not partake of food or drink, or leave the place of employment until they have put off their working clothes and carefully washed their hands.

3. Workers when engaged in processes specified by the employer, shall wear working clothes.

4. Smoking cigars and cigarettes is prohibited during work.

Furthermore it shall be set forth in the regulations that workers who, in spite of reiterated warning, contravene the foregoing provisions may be dismissed before the expiration of their contract without notice.

If a code of regulations has been issued for the industry above indicated, provisions shall be incorporated in the said code.

Regulation 10.—The employer shall entrust the supervision of the worker's health to a duly qualified medical man approved of by the public authority, and notified to the factory inspector, and the said medical man shall examine the workers once at least in every six months for symptoms indicative of plumbism.

The employer shall not permit any worker who is suffering from plumbism or who, in the opinion of the doctor, is suspected of plumbism, to be employed in any work in which he has to handle lead colors or mixtures thereof, until he has completely recovered.

Regulation 11.—The employer shall keep or cause to be kept a register in which shall be recorded the state of health of the workers, and also the constitution of and changes in the staff; and he shall be responsible for the entries being complete and accurate, except in so far as they are affected by the medical man.

The Printing Trades.—It is undesirable that open metal pots should be in a general room where type-casting and setting and machinery are at work. The pots should be hooded and the fumes carried away by exhaust ventilation. It is important that these fumes shall not be distributed too near factories or dwelling places. In cleaning the flues men should be equipped with breathing apparatus. Local exhaust ventilation should be applied to type cases and letter casting machines. Vacuum cleaning of workrooms and type cases is strongly advised. Several hygienic safeguards against plumbism are of course necessary.

The Ceramic Industries.—In May, 1898, in England, the Home Secretary appointed Professor Thorpe and Dr. Thomas Oliver to make special inquiry and ascertain (1) how far the danger (of lead poisoning in potteries) may be diminished or removed by substituting

for the carbonate of lead ordinarily used, either (*a*) one or other less soluble compound of lead, *e.g.*, a silicate; (*b*) leadless glaze; (2) how far any substitutes found to be harmless or less dangerous than the carbonate of lead fit themselves to the varied practical requirements of the manufacturer; (3) what other preventive measures can be adopted.

The recommendations of this committee were:

"1. That by far the greater amount of earthenware of the class already specified, *i.e.*, the white and cream colored ware, can be glazed without the use of lead in any form. It has been demonstrated without the slighest doubt that the ware so made is in no respect inferior to that coated with lead glaze. There seems no reason, therefore, why in the manufacture of this class of goods the operatives should still continue to be exposed to the evils which the use of lead entails.

2. There are, however, certain branches of the pottery industry in which it would be more difficult to dispense with the use of lead compounds. But there is no reason why, in these cases, the lead so employed should not be in the form of a fritted double silicate. Such a compound, if properly made, is but slightly attacked by even strong hydrochloric, acetic, or lactic acid. There is little doubt that if lead must be used, the employment of such a compound silicate—if its use could be insured—would greatly diminish the evil of lead poisoning.

3. The use of raw lead as an ingredient of glazing material, or as an ingredient of colors which have to be subsequently fired, should be absolutely prohibited.

4. As it would be very difficult to insure that an innocuous lead glaze shall be employed, we are of the opinion that young persons and women should be excluded from employment as dippers, dippers' assistants, ware cleaners after dippers, and glost placers in factories where lead glaze is used, and that the adult male dippers, dippers' assistants, ware cleaners, and glost placers should be subjected to systematic medical inspection."

The danger of plumbism is greatest in small works since the technic necessary for the production of leadless glazes make their production in small quantities difficult and discontinuance of the use of lea glazes necessitates the complete alteration of their equipment for manufacture. Furthermore the cost of installation of localized exhaust ventilation is far greater in proportion to the cost of production in the small than in the large factory. Teleky, Chyzer and the Dutch Inspector DeVooys,[1] have demanded the total prohibition of the use of lead glazes and in Bohemia, at the cost of the state, technical instruction has been given in the preparation of leadless glazes in the districts where the ceramic industries are carried on in the homes of the workers.

[1] Rambousek: "Industrial Poisoning," p. 320.

Rambousek, contrary to Oliver, does not expect much good from the obligatory use of fritted glazes.

In Great Britain the china and earthenware industry is placed under Regulations dated January 2, 1913, which supersede the previous Special Rules. These Regulations—thirty-six in number—provide, among other usual provisions, (1) for efficient exhaust ventilation in (*a*) processes giving rise to injurious mineral dust (settling and pressing of tiles, bedding, and flinting, brushing and scouring of biscuit) and (*b*) dusty lead processes (ware cleaning, aerographing, color dusting, litho-transfer making, etc.); and (2) monthly periodical medical examination of workers in scheduled processes.

Zinc, Brass-casting, Metal Pickling, Galvanizing.—Metallic fumes from zinc smelting contain lead, zinc, arsenic, sulphur dioxid and carbon dioxid. These require to be condensed in a specially arranged system. Hoods should be arranged over the fronts of furnaces so that fumes arising during the removal of distillation residues can be conducted into the chimney stock or drawn away by a fan. The residue should be automatically removed from the furnaces into closed receptacles where it is confined until cooled. The mixing of materials for charging as well as the sifting and packing of the zinc dust should be done mechanically under local exhaust ventilation. The regulations to control zinc smelting should be practically the same as those of lead.

In brass-casting the development of brass founders' ague is best prevented by the local exhaustion of zinc oxid fumes as they escape from the crucible. Casting is often done in various places throughout the foundry and it is necessary to install small hoods connected to the exhaust ventilation system by flexible hose which can be moved about to cover any region where the casting may be in operation to protect the face of the pourer.

In metal pickling dangerous acid fumes are evolved and require that the work be done in isolated chambers with exhaust ventilation. Well adapted for this purpose is a wooden compartment closed in except for a small opening in front exhausted by an acid proof stoneware fan which leads the fumes through a stoneware pipe to an absorption tower through which water trickles. The water thus charged with acid can often be utilized.

In galvanizing and tinning processes acroleic vapors and metallic fumes arise as the metal objects are cleansed and dipped. These fumes must be exhausted as described above.

Mercury.—In smelting cinnabar sulphur dioxid and mercury fumes must both be exhausted. The mercury deposit in the flues should only be removed after watering and by workers provided with breathing apparatus and working suits.

The advisability of the substitution of other chemicals for mercury in mirror making has been mentioned before.

In using nitrate of mercury in the manufacture of felt hats, dust and nitric fumes must be exhausted and strict personal hygiene of the workers insisted upon. In France the following notice is required to be posted in animal hair cutting establishments where mercury is used:

"Mercury and its compounds are dangerous. They may enter the body with the air breathed in (dust, vapors), with the food (unclean hands, unclean tables), through the skin (cracks, scratches or cuts).

Should you have any cracks, scratches or cuts, please inform the management immediately of the fact.

Before eating or drinking carefully clean your hands with soap and your mouth with drinking water.

Should you have any pains in the mouth or teeth and excessive quantity of saliva, should you shiver, should you have swelling of the legs, hands or under the eyes, consult the doctor at once."

Air pumps should be substituted for mercury pumps in producing the vacuum in electric light bulbs. Careless handling of this volatile metal will endanger dentists, barometer and thermometer makers.

In chemical factories calomel and corrosive sublimate, and the other mercury salts should be ground and prepared in closed apparatus. The following are general preventive measures for workers in mercury suggested by Dr. George M. Kober:

1. The imperative necessity of providing local exhaust ventilation wherever dust and fumes are evolved, as well as a reduction of working hours during the warm weather, should be generally recognized.

2. All processes involving the use of mercury should be carried on in separate rooms, with a northern exposure of the windows, preferably at a temperature below 60°, so as to reduce the danger from volatilization of the metal to a minimum. Work should be suspended when the temperature exceeds 78°.

3. Wooden floors and work benches are objectionable as they favor the lodgment of spilled mercury in cracks and crevices. Enameled iron benches and smooth asphalt floors, provided with an incline and channels toward receptacles in which the mercury may collect should be chosen. The receptacles should be covered leaving only a narrow opening just sufficient for the metal to enter.

4. Absolute care to prevent spilling of the mercury should be exercised. The work benches should be freed from the metal upon cessation of work, the floors should be sprinkled and swept two or three times a day.

5. The workers should be supplied with respirators in all dust producing processes; overalls and a suitable head covering of a perfectly smooth material should be used and washed weekly. The hair should be worn closely trimmed, preferably no beard; female and youthful employees should be excluded. The use of alcoholic beverages and tobacco should be prohibited.

6. Cleanliness of person and clothing are of the utmost importance. No food should be taken in the workrooms and in no case until after thorough washing of the face and hands with soap and water, using a brush for the finger nails, also washing the mouth and teeth with brush and water, followed by the use of a mouth wash and gargle with a solution of either chlorate or permanganate of potash or phenate of sodium. Heucke recommends the use of akremin soap, containing soluble alkaline sulphides, and believes that the wash water should also contain potassium sulphuratum so as to convert the mercury into insoluble sulphides.

7. The firm should provide not only all the necessities referred to but also the facilities for warm shower and tub baths, suitable lockers for clothing, lunch rooms, and periodical medical examination of the employees, with suspension from work if any are found to present symptoms of mercurial poisoning.

Arsenic and Arseniuretted Hydrogen.—Since arsenic is a powerful poison it is very important that the greatest possible care should be taken by all who are engaged in its manufacture or brought in contact with it. Dr. George M. Kober suggests the following regulations:

The officials and workmen are requested to strictly observe the following rules, and generally to take every precaution to prevent arsenical poisoning:

1. In the process of de-arsenicating Vitriol, care must be taken to maintain an in-draught in the pipes and apparatus, to prevent escape of arsenical fumes, and should an escape be observed, the brine (or hydrochloric acid) should be at once shut off until the effect is remedied.

2. In the precipitating, drying and packing operations, a clean respirator (Grell's improved pattern) must always be used. A clean one must be obtained every morning from the laboratory, and the one used the previous day returned to the laboratory to be cleansed and prepared for use the next day.

3. Every workman engaged in this process shall be provided by the company with a pair of india rubber gloves and a suit of clothes, which he is to put on in the morning and remove on leaving the works at night, and shall take a bath before putting on his ordinary clothing. These special clothes to be washed by the company and supplied

clean to the workman once a week. Workmen must thoroughly wash their hands before taking food in the works.

4. The buildings in which the manufacture of arsenic is carried on must be well ventilated to remove all fumes of chlorid of arsenic or dust of arsenious acid from the atmosphere.

5. Any workman having cuts or abrasions on the skin will not be permitted to work in the arsenical department until such wounds have quite healed.

6. Any workman showing the slightest signs of arsenical poisoning must be examined by a doctor and undergo medical treatment.

Respirators should be worn by those handling white arsenic and packing or dusty processes should be done under local exhaust ventilation. In arsenic work imperviousness of the system is imperative. In technical processes and the trades, substitutes should replace arsenic wherever possible.

All workmen in such industries as may necessitate even the possibility of exposure to arseniuretted hydrogen gas such as in soldering with hydrogen, in galvanizing processes, in extracting metals with acids, and in storage battery manufacture, should be made thoroughly conversant with the danger and instructed in the use of first aid methods in the case of emergency.

Gold and Silver.—The same precautions apply to the extraction of the precious metals by amalgamation with mercury and volatilization as are mentioned under the use of mercury.

Varnishes and Drying Oils.—Closely fitting covers should be applied when linseed oil is boiled with oxidizing substances or in dissolving resin and the fumes should be condensed in cooling apparatus.

Especial care should be exercised in the use of quick drying paints in the interior of rooms or ships or inside steam boilers, or any other enclosed place as fatalities have occurred from the inhalation of such poisonous solvents as benzin and turpentine.

COMPENSATION AND INSURANCE

The third class of preventive measures against diseases of occupation is that of compensation and insurance.

The principal question involved in the establishment of a method of compensation or insurance is that of ascertaining the per cent. to be borne by the community or state and the per cent. to be borne by the employer. Whether, as the supreme courts of some of the states such as California and Massachusetts have recently held, lead poisoning and other occupational intoxications can be considered as "personal injuries" or not, it certainly is as fair that compensation should be awarded the victim of occupational disease as that it should be given

to the victim of an industrial accident. If the employer is required to bear a part of the burden of providing compensation for the employee disabled by industrial disease, the importance of prevention of such conditions is thereby most forcibly impressed upon him. If, however, the employer has done all that he can to make the occupation of his employees conform with the laws in effect covering such occupations and follows the suggestions made by the agencies especially trained and competent in the prevention of these conditions, there is no moral reason why he should pay compensation for occupational diseases. The state in allowing hazardous occupations to exist and thus acknowledging that the products of such occupations are necessary to the commonwealth thereby tacitly admits that it is responsibe for illness specifically due to such occupation and should bear the burden of compensation.

In either case the expense of compensation would prove one of the greatest incentives for adequate prevention of occupational diseases.

LIST OF INDUSTRIAL POISONS

(Translated by Wm. H. Rand, M. D.)

(From Bulletin of the Bureau of Labor, No. 100, May, 1912)

Designation of the substance	Branches of industry in which poisoning occurs	Mode of entrance into the body	Symptoms of poisoning
ACETALDEHYD ETHYLALDEHYD, CH_3COH: A colorless, very volatile fluid, of pungent odor.	Manufacture of vinegar; silver mirror manufacture.	In the form of vapor, through the respiratory organs and mucous membranes.	Irritation of the mucous membranes of the nose, larynx, and bronchi; irritation of the mucous membrane of the eyes; acceleration of the heart's action; profuse night sweats.
ACRIDIN, $C_{13}H_9N$: Crystallizing in colorless needles; contained in anthracene.	Organic dyes industry.	Exerts effect in any state of aggregation on skin and mucous membranes.	Irritation and inflammation of skin and mucous membranes; severe burning and itching of the skin; violent sneezing.
ACROLEIN, C_2H_3-COH: A colorless, very pungent smelling fluid, of fiery taste.	In the trying out of fat and fat containing material, *e.g.*, in bone rendering plants; oilcloth and linoleum factories; varnish-boiling shops; tallow-rendering establishments; soap factories (sulphuric acid process), and stearic-acid factories.	In vaporous form, through the organs of respiration and the mucous membranes.	Itching in the throat; irritation of the eyes, exciting lachrimation, conjunctivitis; irritation of the air passages, bronchial catarrh.
AMMONIA, NH_3: A colorless gas of sharply penetrating odor.	Coke ovens; mirror-silvering industry; coating iron plate with tin or zinc; manufacture of solidified ammonia, sulphate and chlorid of ammonium (sal ammoniac) from ammonia water; manufacture of the carbonate of soda and of orselle dyestuffs; dyeing industry; sewer cleaning; manufacture of bone black; gas plants; varnish and lacquer manufacture; tanning; beet-sugar manufacture; manufacture of ice; refrigeration plants.	In gaseous form, through the organs of respiration. Seldom pure, mostly in combination with other gases. Immediate effect on the conjunctiva and the cornea.	A proportion of more than 0.15 per cent. of ammonia in the air immediately causes an irritable condition of the mucous membranes. Chronic bronchial catarrhs are especially liable to follow long-continued inhalation of small quantities of the gas diffused in the air. From these are to be discriminated the acute conditions of transient illness: Intense irritation of the respiratory organs; violent sneezing; lachrimation, redness of the eyes, inflammation of the cornea and of the conjunctiva; increased secretion of saliva; burning in the pharynx, and a sense of constriction in the larynx; paroxysmal cough, with secretion of tenacious, viscid, even bloody, mucus; embarrassment of respiration, attacks of suffocation; vomiting of serous masses; ammoniacal odor of the perspiration; retention of urine, which may last many hours and even two or three days; acute inflammation of the respiratory organs, and scattered areas of inflammation in the lungs, in severe cases, a fatal outcome. Protracted breathing of small quantities is apt to cause chronic bronchial catarrh.

Special measures of relief: Immediate removal from the poisonous atmosphere; artificial respiration; inhalation of steam; faradic stimulation of the phrenic nerve; free bloodletting; in case of obstinate spasm of the glottis, tracheotomy.

Designation of the substance	Branches of industry in which poisoning occurs	Mode of entrance into the body	Symptoms of poisoning
AMYL ACETATE, $C_5H_{11}CH_3CO_2$: Zapone, a solution of celluloid in amyl acetate and acetone.	Zapone lacquer used as a lacquering agent in metallic ware and jewelry factories; manufacture of metallic wire for incandescent electric lamps; oilcloth manufacture.	In the form of vapor, through the respiratory organs.	Nervous symptoms; headache; fullness of the head; giddiness; nausea; numbness; disturbances of digestion; palpitations of the heart.
AMYL ALCOHOL, $C_5H_{11}OH$: A colorless, oily fluid, of very sharp taste and penetrating, disagreeable odor.	Manufacture of fruit essences, nitrite of amyl, valeric acid, and anilin dyes; rectification of spirits.	In the form of vapor, through the organs of respiration.	Congestion of the head; headache; oppression of the chest; irritation of the air passages.
ANILIN, $C_6H_5(NH_2)$: A colorless oil which acquires a tint on exposure to air and light. Like anilin, all other amid compounds of benzol and its homologues, as toluol, naphthalin, xylol, etc., are poisons. Especially should be mentioned alpha and beta naphthylamin, benzidin, tolidin, paranitranilin, the diamins (phenylene and tolylene diamin) as well as the alphyl and aryl compounds of anilin, like their homologues (dimethyl and diethyl anilin, diphenylamin, etc.).	Manufacture of anilin and its derivatives, as well as of anilin dyes: manufacture of photographic materials and the like.	Absorption through the skin by direct contact or by saturation of the clothing; through the digestive organs; absorption through the respiratory organs as volatile particles and impalpable dust.	The toxicity of the separate products is very different in degree; the para compounds are usually more poisonous than the ortho and meta compounds. ACUTE POISONING.—(*a*) *Mild cases:* Pallor of the skin and mucous membranes, with slight cyanosis; a feeling of weariness and weakness; head symptoms—vertigo, reeling, unsteady gait; deficient elasticity of movement; slow, labored speech; irritability (anilin "pip"); condition of slight inebriation, with loquacity, gaiety, and defective power of orientation; loss of appetite, constipation, and tense, rapid pulse. (*b*) *Severe cases:* Dark blue to swarthy cyanosis; formation of methemoglobin; bounding pulse; "air-hunger," with great frequency of respiration; lowering of sensibility; obliteration of the reflexes; sometimes vomiting, strangury and bloody urine. (*c*) *In the most serious cases:* Sudden prostration; cold, pale skin, blue lips, nose and ears; diminution and even extinction of sensibility; moist, cold skin; small pulse; death in a comatose condition, sometimes after antecedent convulsions. SUBACUTE AND CHRONIC POISONING.—Anemia; slowing of the pulse; disorders of digestion, such as eructations, loathing of food, vomiting, diarrhea, and eczematous and pustular eruptions on various parts of the body, especially on the scrotum; nervous symptoms, as general debility, headache, ringing in the ears, vertigo, unrestful sleep, disturbances of sensibility, often also of motility; spasmodic muscular pain. Subacute and chronic poisonings are very rare. Anemia and retarded pulse are early symptoms. The blood is of a brownish hue, but microscopically unchanged; occasionally the urine contains blood.

Measures of relief: At the first symptoms of poisoning, immediate removal from the workroom to a cool shady spot; change of clothing; cool affusions; administration of oxygen in connection with artificial respiration; in severe cases, bloodletting with subsequent infusion of physiological salt solution; copious ingestion of milk; in case of weak action of the heart, stimulants (black coffee, camphor, ether, but no alcohol); caution against the use of alcohol during and immediately after labor; abstinence is advisable.

Designation of the substance	Branches of industry in which poisoning occurs	Mode of entrance into the body	Symptoms of poisoning
ANILIN DYE-STUFFS: The majority of the very numerous anilin dyes are non-poisonous. Generally the basic dyes are more dangerous than the acid dyes. Regarded as suspicious or injurious to health are—			
(*a*) The various phenol nitrates, dinitrophenol, dinitrocresol (saffron yellow, anilin orange), picric acid (trinitrophenol).	Anilin dye factories; dyehouses; also manufacture of explosives.	Action on the skin; in the form of dust, through the respiratory organs; the digestive organs.	Itching, dermatitis, efflorescent eruption, yellow discoloration of the cuticle and conjunctiva; sneezing and nasal catarrh; inflammation of the buccal mucous membrane; bitter taste; disturbances of digestion; irritation of the central nervous system and of the kidneys. Picric acid is a feeble former of methemoglobin; industrial poisonings by it are extremely rare.
(*b*) The many naphthol nitrates, dinitronaphthol, Manchester yellow, dinitro and naphthol calcium; tetranitronaphthol.	Anilin dye manufactories; dyehouses.	Action on the skin; in the form of dust, through the respiratory organs; the digestive organs.	Blood poisons, forming methemoglobin. The morbid symptoms resemble those in poisoning by amido compounds; ailments of the central nervous system in great variety; paralyses.
(*c*) The nitroso dyes.	Anilin dye manufactories; dyehouses.	In the form of dust on the skin.	Intense irritation of the skin, caused, it is asserted, partly by using excessive quantities of chlorid of lime in cleansing the skin.
(*d*) The aurantia—hexanitrodiphenylamin; imperial yellow, its sodium salt.	Anilin dye manufactories; dyehouses.	In the form of dust on the skin.	Intense irritation of the skin, caused, it is asserted, partly by using excessive quantities of chlorid of lime in cleansing the skin.
(*e*) Ethyl and methyl violet.	Anilin dye manufactories; dyehouses; manufacture of colored pencils.	As dust or fine particles in the eyes.	Inflammation of the conjunctiva or the cornea.
(*f*) The Meldola dyes, corvulin, indulin, fast black.	Anilin dye manufactories; dyehouses.	As dust or atomized solution (in dyeing by the spraying process); action on the skin and respiratory organs.	Eruptions; severe irritation of the mucous membranes; uncontrollable sternutation.
(*g*) Chrysoidin, fast black.	Anilin dye manufactories; dyehouses.	In the form of dust; effect on the skin.	Eruptions (probably superinduced by the use of excessive quantities of the chlorid of lime in washing the hands).
(*h*) Bismarck blue	Anilin dye manufactories; dyehouses.		
ANTIMONY COMPOUNDS: **Trioxid of antimony,** Sb_2O_3; **Antimony trichlorid,** $SbCl_3$ (antimonious chlorid, butter of antimony, antimonial cre butter); **Tartar emetic** (tartrate of antimony and potassium), $2\,(C_4H_4K[SbO]O_6)\,H_2O$; **Golden sulphid,** Sb_2S_5 (antimony pentasulphid), antimony colors.	Extraction of antimony and its compounds; burnishing of rifle barrels and steel ware; manufacture of antimony alloys, type and stereotype metal, hard lead [ammunition factories], britannia, and white metal; remelting of old and scrap metal; manufacture of anilin dyes, fireworks; vulcanizing and red-dyeing of india rubber (antimony pentasulphid); mordants and fixing materials in cotton dyeing and textile printing.	In the form of vapor (trioxid of antimony, antimonious acid, sulphid of antimony), through the organs of respiration; irritation of the skin; in the form of dust, in the manipulation of britannia and type metal.	Intensely itching eruptions of the skin, caused by local irritation and aggravated in the case of a perspiring skin; inflammation of the mouth, throat, and stomach; constipation and intestinal colic; in acute cases, diarrhea, albumin in the urine, loss of strength, weakness of the heart, vertigo, and faintness. It appears to be somewhat doubtful, however, whether all of the enumerated compounds of antimony are detrimental to the health of the workers in them.

Designation of the substance	Branches of industry in which poisoning occurs	Mode of entrance into the body	Symptoms of poisoning
ARSENIC COMPOUNDS: Arsenic trioxid, As_2O_3 (arsenic, white arsenic, smelting dust); arsenous chlorid, $AsCl_3$; arsenic colors, *e.g.*— **Scheele's green** (Swedish green), arsenite of copper. **Schweinfurt green** (patent, original, new, moss, mountain, parrot, May, Kaiser, Cassel, Paris, Vienna, Kirchberg, Leipsic, Würzburg, Swiss green), compound of the arsenite and the sulphid of copper. **Brunswick green,** oxychlorid of copper with copper oxid and sulphate of lime. **Neuwied green.** (Similar, only a larger proportion of ars nic trioxid.) **Cochineal** (Vienna red), arsenic acid with extract of Pernambuco wood.	Arsenic mining; roasting of arsenic-bearing ores; manufacture of glass, colored chalk, chlorid of arsenic for etching on brass; shot manufacture; metal working; manufacture of arsenic colors; preparation of organic dyestuffs, colored lights, textile printing, and dyeing; manufacture of wall paper and colored paper; tanning; manufacture of oilcloth and artificial flowers; taxidermy painting (outside and decorative); pyrotechnics (Indian white-fire). It is to be observed that zinc, silver, lead, bismuth, copper, and the commercial acids often contain more or less arsenic.	In the forms of gas and dust, through the respiratory organs and mucous membranes, the stomach, and intestinal canal.	ACUTE POISONING.—The first symptoms usually appear after half an hour or an hour, viz., constriction of the esophagus, pains in the stomach and bowels, vomiting, diarrhea, debility, cold, bluish skin, sural cramp, lowering of heart's energy, vertigo, headache, faintness, illusions, loss of consciousness, convulsions; death, sometimes choleraic symptoms. In mild cases, burning in the pharynx, vomiting, salivation, difficult deglutition and indigestion. CHRONIC POISONING.—Constant and persistent headache combined with melancholia, disinclination to labor, and sleeplessness, which are sometimes the only symptoms; further, gastric disturbances, such as vomiting and diarrhea, which result in emaciation and decline of strength; persistent symptoms of catarrh of the mucous membranes, such as coryza, pharyngitis and bronchitis; frequently skin diseases in varying form: Erythematous, papular, and pustular cutaneous eruptions, which also produce abscesses with infiltrated and indurated borders; falling out of the hair and nails; melanosis—that is, the deposition of a brownish pigment, not containing arsenic, on the neck, trunk, and extremities. In severe cases disturbances of the central nervous system; intense, lightninglike, lancinating pains; formication; furriness of the skin; impairment of the sensibility; chilliness; weakness of the muscles, also unilateral or bilateral paralysis, and often loss of the tendon reflexes; sometimes fever; albuminuria. The paralyses are transient, or they may last for years, leaving not infrequently permanent disturbances.

Special measures of relief: If arsenic has been ingested, thorough gastric lavage is necessary; then administer at once by the mouth five tablespoonfuls of a solution of calcined magnesia (70 g. to 500 g. of distilled water); afterward give a tablespoonful every five minutes until a movement of the bowels occurs; the internal use of lime water also is recommended for rinsing out the stomach and as an antidote; to counteract the exhaustion, cold affusions, rubbing, hypodermic injections of ether and camphor.[1]

In case of chronic arsenical poisoning: Electric vapor baths and electrical treatment are in order; the disturbances of the stomach are to be treated with calcined magnesia and unirritating liquid nourishment (milk, milk porridge, rice porridge, salep); the cachexia, by fresh air and nutritious diet; in paralyses, use iodin preparations and electricity.

ARSENIURETED HYDROGEN, AsH_3: A colorless, extremely offensive gas with the odor of garlic.	This gas is formed everywhere when, in the use of arsenical acids and metals, hydrogen is generated for technical purposes (*e. g.*, the filling of children's toy balloons); in soldering and etching with arsenic-containing metals or acids, *e.g.*, enamel ware factories, tin, zinc, and lead plating works; impure iron silicate, by the absorption of water, develops arseniuretted hydrogen.	In the form of a gas, through the organs of respiration (generally mixed with hydrogen).	At first no disturbances, or only slight indisposition; after some hours, chilliness, vomiting (food, bile, then blood), pain in the back, giddiness, ringing in the ears, faintness, small pulse, bluish discoloration of the mucous membranes; labored respiration; urine at times dark or even black, containing blood or hemoglobin. After twenty-four hours, yellow hue of the skin and mucous membranes; from absorption of biliary fluids, fetor of the mouth (resembling garlic), swelling and sensitiveness of the liver and spleen, headache, delirium, mortal anguish; death or slow convalescence.

Special measures of relief: Fresh air and oxygen; later bloodletting; use of an alkalin solution of common salt; mild alkalin drink; analeptics (coffee, camphor).

[1] Hydrated sesquioxid of iron is not mentioned.

Designation of the substance	Branches of industry in which poisoning occurs	Mode of entrance into the body	Symptoms of poisoning
BENZIN: A mixture of low-ebullition portions of petroleum, known commercially under various names, *e.g.*, petroleum, benzin, ligroin, gasolin.	Benzin distillation; chemical cleansing plants, glove cleaning; removal of fat from bones, fat solvent; lacquer, varnish, and india rubber industries; manufacture of waterproof materials (application of the rubber mass dissolved in benzin); ornamental feather factories; used as a source of power.	In the form of vapor, through the respiratory organs; to a less extent, probably, through the skin also.	Headache, vertigo, nausea, vomiting, cough, irregular respiration, weakness of the heart, drowsiness, and deep sleep with cyanosis of the countenance, coldness of the skin and complete insensibility; on awaking, headache, vertigo and depression, fibrillar twitching of the muscles, trembling, especially of the musculature, as if from chilliness. Benzoic acid is found in the urine. CHRONIC POISONING.—Headache, flashes before the eyes, ringing in the ears, psychosis with excitement and a state resembling inebriation, sensory disturbances and hallucinations (but the prodromata of chronic benzin poisoning will also appear). The occurrence of chronic poisoning by benzin has been contested. The symptoms vary greatly because the benzin used technically is a complex mixture and not always of the same composition.

Special measures of relief: Removal of the patient into fresh air; in severe cases, stimulants, like coffee, camphor; then cold affusions.

BENZOL, C_6H_6. A very unstable, colorless fluid, burning with a bright, very sooty flame; extremely volatile; its homologues, *e.g.*, toluol, xylol, and cumol.	Manufacture of benzol, its homologues and numerous derivates; technical use of these products in the manufacture of colors, in carburizing illuminating and water gas, in refining and dissolving of caoutchouc, resins, fats, alkaloids, iodin, phosphorus, and sulphur; in the removal of grease from materials; dye works, laundries; lacquer and varnish factories; the rubber industry.	In the form of vapor, through the respiratory organs; reabsorption through the skin.	Benzol, its homologues and the rest of the hydrocarbons of coal tar, have a specific affinity for the central nervous system and a general action on the protoplasm of the organic cells (fatty degeneration). Female workers, particularly in their developmental years, especially at the time of menstruation, are more susceptible than men to the poisoning, and in an extraordinary degree to the subacute and chronic forms of it. ACUTE POISONING.—(*a*) *In mild cases:* Cerebral disturbances, humming in the ears, giddiness, somnolence, a condition resembling inebriation, vomiting and irritant cough, slight flushing of the face. There is often euphoria. (*b*) *In severe cases:* Symptoms on the part of the central nervous system, muscular tremor, like chilliness from exposure to cold; trembling of the whole extremities; finally, tonic and clonic spasms; euphoria; pale, livid skin; lips remarkably scarlet hued; blood bright red, thin. Discolorations of the skin, like those in anilin and nitrobenzol poisoning, are wanting in benzol poisoning. (*c*) *In the most violent cases:* Hallucinations, delirium, protracted unconsciousness, and death in tonic convulsions. SUBACUTE AND CHRONIC POISONING.—Numerous spots of extravasated blood in the skin [petechia] similar to those of morbus maculosus, together with severe anemia; hemorrhage from the mucous membranes—in women, from the genitals; fatty degeneration of the internal organs (heart, liver, kidneys).

Special measures of relief: Prompt removal of the patient into the fresh air; inhalation of oxygen; exclusion of female workers from every employment in which benzol is used.

<table>
<tr><th>Designation of the substance</th><th>Branches of industry in which poisoning occurs</th><th>Mode of entrance into the body</th><th>Symptoms of poisoning</th></tr>
<tr><td>CARBON DIOXID, CO_2: A specifically dense, odorless, colorless gas, collecting near the ground or floor.</td><td>Generated in mines by the process of breathing, by the burning of miners' lamps, and by blasting; in lime and brickkilns and dolomite calcining kilns; in decomposition and putrefaction gases; in tanneries (tan pits); in sugar mills (saturation vessels); manufacture of carbonic acid and of mineral waters; spirit distilleries, compressed yeast factories, breweries, fermenting rooms and wine cellars; in sewer and well gases; in firing and heating establishments; in the lighting of workrooms; by the exhaled air in closed workrooms and caissons.</td><td>In the form of gas, by inhalation.</td><td>Large quantities occasion sudden death by suffocation.
With the inhalation of smaller quantities the symptoms of illness begin with pressure in the head, vertigo, ringing in the ears and sparks before the eyes, disturbances of respiration, such as hurried breathing and pain in the chest, sometimes psychic excitement and convulsions. Usually in case of more protracted effect there is loss of consciousness and of the power of motion (or even death by suffocation), with gradual decline of the pulse and respiration, and often with the occurrence of delirium.
On prompt removal from the poisonous atmosphere there is a restoration of consciousness with subsidence of the symptoms of illness and recovery in a few days.
The occurrence of chronic poisoning by carbon dioxid is doubtful.</td></tr>
<tr><td colspan="4">Special measures of relief: Examination of the air of the suspected places before entering them; immediate removal from the poisonous atmosphere; artificial respiration to be persevered in for a long time; finally inflation of the lungs with oxygen; cold affusions; stimulation of the skin; restoratives.</td></tr>
<tr><td>CARBON DISULPHID (carbon sulphurate), CS_2: In a pure state it is a limpid, highly refractive, extraordinarily volatile fluid, having an odor like that of chloroform; imperfectly refined, its hue is pale yellow and its odor offensive.</td><td>Manufacture of CS_2; an agent for extraction of sulphur from the mass in the process of gas purification; disinfection; a solvent for caoutchouc, gums, fats, oils, etc.; in vulcanizing caoutchouc and rubber (patent-rubber factories); for the extraction of lanolin, the refining of tallow, stearin, paraffin, and wax; production of carbon chlorid; assembling and setting up carriage wheel rims and rubber tires; imitation-silk factories.</td><td>In the form of vapor, through respiration; in fluid form, through the skin, e.g., at the dipping of the hands in the fluid.</td><td>It causes heavy damage to the red blood corpuscles and to the central nervous system.
ACUTE POISONING.—In mild cases, marked stupefaction and a sense of intoxication; in more intense poisoning, pallor of the countenance, flaccidity of the arms and legs, even complete insensibility, obliteration of all reflexes, loss of consciousness, due to paralysis of the central nervous system. With the inhalation of concentrated vapor there is a fatal result in a few minutes.
CHRONIC POISONING.—The earliest symptoms (first becoming manifest, sometimes after employment for a few weeks, but, for the most part, after months or even years) are headache, extending from the root of the nose to the temples, a sensation of giddiness and stupefaction, particularly at evening after the close of labor; later, pain in the extremities, muscular weakness with trembling, spasms or fibrillar twitching, also contractures, transient and permanent paralyses, with atrophy of the muscles; deafness; itching and formication on the skin, reduction of the reflexes, circumscribed and more extensive areas of anesthesia and analgesia; acceleration of the heart's action, nausea, vomiting, colic, alternate diarrhea and constipation, the later condition prevailing in the later stages of the disease; emaciation, disturbance of the sense of vision, sometimes transient, but rare in the initial stage; retrobulbar neuritis, choroiditis, central scotoma, disturbances of the senses of smell and taste. In respect to the central nervous system there is at first a condition of excitement, followed by depression; subsequently, very irritable, violent, and explosive temper, with hyperstimulation of the sexual instinct; later, its abnormal decline. After several weeks or months, relaxation, melancholy, a dreamy manner, weakness of memory, puerile enunciation, obtuseness.
According to Charcot, psychic disturbances occur in 87.5 per cent. of the cases. Mental diseases under the semblance of acute mania and dementia occur with good prospect of recovery; the severer forms appear in cases where there is hereditary predisposition. There have been observed also local evidences of the paralyzing effect of the carbon disulphid upon the parts brought into contact with it, especially in the fingers.
The prognosis, so far as the preservation of life is concerned, is favorable; as to the full restoration of health, it is unfavorable.</td></tr>
<tr><td colspan="4">Special measures of relief: In acute poisoning, removal into the fresh air, warm baths, cold affusions; when there are symptoms of paralysis, electrical treatment; in disturbance of vision, potassium iodid and vapor baths; interdiction of the practice of dipping the unprotected hands into carbon disulphid.</td></tr>
</table>

Designation of the substance	Branches of industry in which poisoning occurs	Mode of entrance into the body	Symptoms of poisoning
CARBON MONOXID, CO: A colorless, tasteless gas, and, when in a state of diffusion, odorless, burning with a blue flame in the air. **Coal vapor** has from 0.5 to 5 per cent. of CO. **Illuminating gas,** 6 to 10 per cent. of CO and 33 to 40 per cent. of mine gas. **Water gas,** a mixture of 41 per cent. CO, 50 per cent. hydrogen, 4 per cent. CO_2, and 5 per cent. N. **Producer gas** contains 34 per cent. CO, and 60 per cent. hydrogen gas.	In industrial plants with defectively planned or ill-tended firing and heating arrangements; plants for the production of industrial gas; mining (mine gases); coal mines; blast furnaces (furnace gas); Cowper apparatus; gas purification; coke ovens, smelting furnaces; gas machines; lime and brick kilns, dolomite calcining kilns; iron and metal foundries (drying of the molds); soldering in tin shops; charcoal burning; resin distillation; ironing; heating with open coal brasiers or coke stoves (drying the plaster and walls of new buildings); drying chambers.	In the form of gas, through the respiratory organs.	ACUTE POISONING.—Increased blood pressure at first, with slowing of the pulse and pounding heartbeat; later, lowering of the pressure, with rapid but small pulse, and, not infrequently, with discrete spots of dilation in the superficial blood vessels. Remarkably pale red discoloration of the blood and of the dilated spots; formation of carbon-monoxid hemoglobin is demonstrable by the spectrum.[1] (*a*) *Disturbances of the general health:* In mild cases, dull headache, flashes before the eyes, giddiness, ringing in the ears, nausea and fullness in the gastric region. (*b*) *In severe cases:* Bluish discoloration of the skin; spasmodic, wheezing respiration; sometimes tonic and clonic convulsions, more often paralytic symptoms, either with weakness of all the extremities or of the lower only, or, indeed, of only single groups of muscles, including also the facial muscles. The convulsive stage, which may be altogether absent, is succeeded by the stage of asphyxia, with sensory and motor disturbances, involuntary voiding of urine, semen, and feces; subnormal temperature; weak, slow and intermittent pulse; loss of consciousness. As sequels there have been observed pneumonias, inflammations of the skin, paralyses and psychoses, the last two often pursuing an unfavorable course. CHRONIC POISONING (among ironers, firemen, cooks, etc.)—Frequent headaches, dizziness, nausea, vomiting, coated tongue, weakness of memory; anemia without chlorosis; "hot flushes," formication, palpitation of the heart, insomnia, general debility and feebleness of the psychic functions.

Special measures of relief: Removal from the poisonous atmosphere; admission of fresh air; artificial respiration, with inflation of the lungs by oxygen for hours, if necessary; keep head of the injured person slightly elevated; subcutaneous injection of ether; camphor; cold affusions; rubbing; mustard poultice; electrical treatment; insufflation of ammonia vapor; administration of black coffee; alkalin salt infusion; entering where CO may be generated only when protected by safety masks and by a constant supply of air.

[1] An elementary knowledge of the function of the hemoglobin is indispensable to an understanding of the deadly effect of the transformation of hemoglobin into "carbon-monoxid hemoglobin." When so changed, it is useless in the body, for it can no longer carry and distribute oxygen to the tissues. Hence all of the blood charged with this poison is virtually destroyed—lost to the system as surely as if it had escaped from a severed artery. So, if a considerable proportion of the blood becomes saturated with this gas, death is inevitable, not by suffocation, as commonly imagined, but by carbon-monoxid poisoning.—W. H. R.

39538°—Bull. 100—12——2

Designation of the substance	Branches of industry in which poisoning occurs	Mode of entrance into the body	Symptoms of poisoning
CHLORID OF LIME, $CaOCl_2$: A white granular, somewhat desiccative, powder, having the odor of hypochlorous acid, and containing 35 to 40 per cent. of chlorin.	Manufacture of the chlorid of lime; use of the chlorid of lime as an oxidizing and chlorinating agent in the chemical industry (for example, dyestuffs); disinfection; manufacture of chloroform, chlorin, oxygen; bleaching of linen, cotton, paper; cotton print works.	In the form of vapor or dust, through the respiratory organs (inhalation of chlorin gas); direct action on the skin.	More or less severe, irritating cough, symptoms of inflammation in the upper air passages; difficulty of breathing, bronchitis, asthma, sometimes hemoptisis, irritation of the conjunctiva, lachrimation; skin hot from action of chlorin; hyperhidrosis; intensely itching and burning eruption on the skin, eczema, burns from the dust of lime and its chlorid.

Special measures of relief: Admission to the employment of such, and only such, workmen as are sound and strong, and free from any predisposition to catarrhal affections; technical arrangements which permit the charging and emptying of the chambers from the outside.

CHLORIN, Cl: A yellowish green, suffocating gas, of penetrating odor, which forms a solution of a greenish yellow color when dissolved in water.	Manufacture of chlorin, chlorid of lime, and of organic chlorin products; bleacheries; paper mills; laundries; ironing; tinning works; manufacture and use of disinfecting agents containing chlorin.	In the form of gas, through the respiratory organs.	The smallest quantities excite severe suffocative sensations and necessitate leaving the room, so that acute chlorin poisoning seldom occurs. SYMPTOMS OF CUTANEOUS DISEASE.—Burning, stinging, formation of nodules, blebs, and even open wounds of the skin. EFFECT ON THE MUCOUS MEMBRANES.—Lachrimation, coryza, cough, oppression of the chest and intense dyspnea; bronchial catarrh with hemorrhage; sometimes, lobular pneumonia. The concentrated vapor causes uncontrollable cough, spasm of the glottis, dyspnea, cold sweats, cyanosis and small pulse; death occurs within a few minutes (sudden collapse). IN ITS CHRONIC EFFECT.—Distress in the gastric region; chronic catarrh of the stomach; pyrosis; pallid countenance; catarrh of the respiratory tract; lobular pneumonia; headache, vertigo, insomnia; gradual emaciation and premature senescence. CHLORIN ACNE.—(Occasioned in the electrolytic production of chlorin by chlorinated carbureted hydrogen.) Inflammatory processes in the dermal glands; the occurrence of unusually diffuse, confluent comedones with indurated, dark-green heads; solid infiltration of the sebaceous follicles, their inflammation and suppuration causing pustules and boils.

Special measures of relief: Removal of the patient into the fresh air; inhalation of amyl nitrite; artificial respiration; on account of the paralyzing effect of the chlorin on the heart, stimulants are required (black coffee, subcutaneous injection of camphorated oil); to control the irritating cough, hypodermics of morphin or cautious inhalation of steam.

For the prevention of chlorin acne: Substitution of anodes made of molten metallic oxides for the carbon anodes.

CHLORODINITROBENZOL, $C_6H_3(NO_2)_2Cl$: Forming yellow crystals. (*See* Nitrobenzol.) **CHLORONITROBENZOL,** $C_6H_4NO_2Cl$: Forming yellowish crystals of aromatic odor. (*See* Nitrobenzol.)			

Designation of the substance	Branches of industry in which poisoning occurs	Mode of entrance into the body	Symptoms of poisoning
CHROMIUM COMPOUNDS: Chromic acid, anhydrous, CrO_3; chromates and bichromates, *e.g.*, sodium chromate, Na_2CrO_4; sodium bichromate, $Na_2Cr_2O_7$; lead chromate, $PbCrO_4$. **Chromium colors:** Chrome yellow (acid chromate of lead); chrome orange (basic and neutral chromate of lead); chrome red (chrome-cinnabar); acid chromate of lead oxid and lead hydrate; chrome green, poisonous only as a mixture of chrome yellow and paris blue. (*See also under* Lead.)	Manufacture of chromium preparations, chrome colors, and hectograph composition; photography (color and carbon printing); oxidizing agent in the tar-color industry; manufacture of matches; wet batteries; bleaching fats, oils, and wax; mordant in Turkish red dyeing, textile printing (for neutralizing colors and for dyeing); chrome tanning (two-vat process); staining of wood.	Absorption by the skin and mucous membranes; in the form of dust, through the respiratory organs.	The chromates act very much like chromic acid itself; pitlike, phagedenic ulcers, burrowing deep and spreading wide, very difficult to heal and very painful, occur almost exclusively on the skin of the hands, more rarely on the arms, thighs, scrotum, and penis, resembling syphilitic ulcers; they also appear, though seldom, on the mucous membrane of the tonsils and of the hard and the soft palate. With rare exceptions is there extension of the inflammation to, and perforation of, the nasal septum at the cartilaginous portion; eczematous eruptions. Irritation of the conjunctiva. IRRITATION OF THE BRONCHIOLES.—Chronic bronchial catarrh, and small areas of inflammation in the lungs. In recent years the last mentioned symptoms are hardly ever encountered in a remarkably wide field of observation. It is at least extremely doubtful if disease of the kidneys is ever caused by chromium. In handling chromium dyes containing lead there is danger of chronic lead poisoning.

Special measures of relief: Chromium ulcers are successfully overcome by careful treatment of the slightest injuries to the skin, and by the immediate, complete, and skillful closure of the lesions.

CYANOGEN COMPOUNDS: Dicyanogen, C_2N_2; Prussic acid, HCN: Hydrocyanic acid, a colorless, highly volatile fluid, of penetrating, pungent, and irritating odor. **Natrium cyanid** (NaCN), **Cyanid of potassium** cyanid (KCN): A colorless salt, forming crystals which, after fusion, recrystallize, but readily decomposes on exposure to the air, setting free hydrocyanic acid. **Rhodanic** (sulphocyanic, SCN) **compounds:** Poisonous dose of the dilute hydrocyanic acid, 0.06 g.	Extraction of gold; silver and gold plating, galvanoplasty, electroplating; manufacture of cyanogen compounds and inorganic processes (when organic residua are heated with alkalis); reduction of residuum to gas; blast furnaces; gas works (purification process), dye works and printeries; photographic establishments; manufacture of celluloid.	In the form of gas, through the respiratory organs; prussic acid also through the epidermis.	Generally speaking, industrial poisonings by cyanogen are rare. ACUTE POISONING.—Moderate quantities of the gas cause vertigo, headache, rush of blood to the head, oppression of the chest, palpitation of the heart, a sensation of constriction at the throat with pharyngeal irritation and dryness, nausea and vomiting, difficult, gasping respiration, with retention of consciousness. To the stage of dyspnea succeeds that of spasm with cold, perspiring skin, convulsions and involuntary micturition, with loss of consciousness. In the stage of asphyxiation there are temporary suspension of respiration, retardation of the heart's action, lividity of the skin and mucous membranes, lowering of the body temperature; with inhalation of large quantities, the stage of asphyxia supervenes immediately. Dilation of the pupils; loss of consciousness; a few gasping inspirations; cyanosis of the skin and mucous membranes; collapse; death. CHRONIC POISONING (Very doubtful).—Headache, vertigo, unsteadiness of gait; nausea, loss of appetite, disturbances of the gastric and intestinal functions; slowing of the pulse; albuminuria.

Special measures of relief: Fresh air; artificial respiration; administration of oxygen; cold affusions and friction; hypodermatic injection of ether, camphor; if the poison has been taken into the stomach, give emetics, then immediately rinse out that viscus with water, with the addition of one-quarter to one-half of 1 per cent. of potassium permanganate. Kobert recommends a 3 per cent. solution of hydrogen binoxid for subcutaneous injection, in doses of 1 cubic centimeter, at different points in the body. But on the other hand H_2O_2 is deemed unsuitable, and an alkalin solution of ferric sulphate, or an antidote for arsenic with some ferric salt, is indicated as the best remedy. To control the convulsions give morphia hypodermically.

Designation of the substance	Branches of industry in which poisoning occurs	Mode of entrance into the body	Symptoms of poisoning
DIAZOMETHANE, CH_2NH_2: A very volatile yellow gas.	In methylizing of every kind.	As gas, through the lungs; effect on the skin.	ACUTE POISONING.—Severe headache; great physical depression; grave lesions of the lungs; other effects like those of dimethyl sulphate.
DIMETHYL SULPHATE, $(CH_3)_2SO_4$: A colorless oily fluid.	Production of methyl ethers, methyl esters and methyl amines; manufacture of artificial perfumes.	In the form of gas, through the respiratory organs; direct action on the skin.	Strongly corrosive effect on the skin and mucous membranes; burns; pains in the nape of the neck and in the thoracic cavity; hoarseness; destruction of the mucous membrane and aspiration of the broken-down products into the lungs; lachrimation, conjunctivitis, formation of erosion-eschars, and edema, photophobia and parenchymatous clouding of the cornea; even coma, convulsions, paralysis, and a fatal outcome.
	tion; manu- of many ; prepara- especially in al-tar color- y; preserv- d hardening an and zoo- preparations.	In the form of vapor, through the respiratory organs and mucous membranes.	Intense irritation of the skin and mucous membranes.

o not enter the disinfection chamber until after the introduction of tion.

aist. ner part, impure, containing arsenic, among other admixtures.	ment with of previ- roasted ores; es (glazing), ing works, actories, sol- in the chem- lustry, manu- of chlorid lphate of soda, of muriatic acid, stannic acetate, etc.; manufacture of artificial iertilizers; bleachng, shoddy industry, cotton-print works; carbonizing of materials; india rubber industry.	Action on the skin and nasal mucous membrane; seldom in vaporous form, affecting the respiratory organs.	As a rule the rarefaction of the hydrochloric acid gas is so considerable in the industries where it is used to any extent worth mentioning that only in exceptional cases do injurious effects occur, such as irritation of the respiratory organs. A proportion of 0.05 per mille of hydrochloric acid in the air is well borne, but only for a short time. A greater concentration (as well as the often-repeated inhalation even of moderate quantities in manufacturing industries) causes chronic irritation of the mucous membranes to which the vapor has access. There result also catarrh of the conjunctiva, coryza, pharyngeal, laryngeal, and bronchial catarrh, together with dental caries. Concentrated HCl vapor may cause unconsciousness and death.

WEDNESDAY

JULY

29

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Special measures of relief: Removal of the patient from the dangerous atmosphere; inhalation of a finely nebulized solution of sodium bicarbonate.[1]

[1] In addition, for acute poisoning, give atropin (1/60 grain) subcutaneously to stimulate the pneumogastric.—W. H. R.

Designation of the substance	Branches of industry in which poisoning occurs	Mode of entrance into the body	Symptoms of poisoning
HYDROFLUORIC ACID or **FLUORIC ACID,** HF: A colorless gas, of pungent odor and forming a dense mist in the air.	Production in chemical works; glass factories, etching on glass; laboratories of the pottery industry; extraction of the fluorides of antimony (substitute for tartar emetic in dye-works); fertilizer factories (extraction of phosphorites); bleaching of cane for chair seats and extraction of its silicates.	In the form of gas, through the respiratory organs. In a fluid state it has an immediate action on the skin and mucous membranes.	Intense irritation of the eyelids and conjunctiva, coryza, bronchial catarrh with spasmodic cough, ulceration of the nostrils, gums, and oral mucous membrane; also painful ulcers of the cuticle, erosions and formation of vesicles; suppuration under the finger nails.
LEAD, Pb: A bluish white, highly lustrous metal, which on exposure to the air acquires a gray tarnish. **Lead alloys.** **Lead colors,** other lead compounds. **Lead sulphuret** (galena) is held to be nonpoisonous, and some lead polysilicates are regarded as nearly so.	Smelting of lead and lead-bearing ores; manufacture and use of articles made of metallic lead (sheets, plates, boxes, pipes, wire, cans, flasks, pails, kettles, faucets, retorts); manufacture and use of lead alloys, as type metal, shot (tin foil), for example, in type foundries, tin shops, bottle-cap factories, composing rooms, file-cutting works; manufacture and use of lead colors and other lead compounds, as litharge, white lead, Krems white, red lead, lead chromates, acetate of lead, lead chloride in lead color works and storage-battery factories, in the trade of painter, house painter and varnisher; plants for installation of gas and water; in the ceramic industry, the textile industry, etc. It is to be observed that materials containing lead may occasionally be employed in every industry, and that lead colors and other lead compounds are often met with in trade under fanciful names.	Absorption of lead and lead compounds occurs — (1) In isolated cases through the skin; whether through the uninjured skin is doubtful; (2) in the form of vapor (very finely divided oxid of lead), and as dust, through the respiratory organs; (3) by way of the digestive tract by means of contaminated food and drinks (for example, cigars, cigarettes, chewing tobacco). By inhalation the dust, laden with lead, finds lodgment in the upper respiratory tract, and, mixed with saliva, may reach the stomach.	Industrial lead poisoning appears as a rule in the chronic form and arises from continuous absorption of the most infinitesimal quantities of lead during a protracted period of time (weeks, months, and even years). The beginning is insidious, with disturbances of the general health, a sense of weakness, decline of bodily strength; sallow, pale-yellowish hue of the skin. Distress in the region of the stomach, eructations, lack of appetite, metallic taste in the mouth and fetid breath. The blue line (blue-gray discoloration of the gums) which, however, may be absent, even in the course of a severe attack; lead colic with most obstinate constipation, retention of urine; plumbic arthralgia (lacerating, boring), occurring for the most part paroxysmally, chiefly in the lower extremities, more rarely in the upper, often interpreted as a symptom of rheumatism of the joints; frequently, fibrillar trembling of the fingers. Typical are the lead paralyses, of which disturbances of sensation (paresthesia and anesthesia) take the precedence. Paralysis generally affects the extensor muscles of the arm and hand, with atrophic manifestations; more rarely, the flexor muscles. Sometimes also there are paralyses of the extensors and flexors of the lower extremities or muscles of the shoulder. From experience it is known that those groups of muscles are especially affected which are most used in the occupational activity. Transient blindness, but also gradually progressive atrophy of the optic nerve; temporary loss of the special senses of smell and taste; violent, often fatally ending disease of the brain (saturnine encephalopathy), sometimes preceded only by slight premonitory symptoms, as irritability and headache, ringing in the ears, insomnia; more often, slowly increasing mental disturbances precede; epileptiform convulsions, hallucinations; morbid changes in the blood vessels and of the heart and kidneys (contracted kidney); increase of blood pressure and granular degeneration of the red blood corpuscles. Disturbances in the sexual sphere in women; abortion, premature birth, low vitality of the children.

Measures of relief: Discontinuance of work in lead at the slightest symptoms of lead poisoning. In lead colic, give first, by the mouth or subcutaneously, morphia, opium, or atropin; afterward, cathartics (castor oil or podophyllin); in paralysis, electrical treatment, massage and baths; in every case, strengthening diet, iodid of potassium, and sudorifices.

Designation of the substance	Branches of industry in which poisoning occurs	Mode of entrance into the body	Symptoms of poisoning
MANGANESE DIOXID, MnO_2: Brown mineral (occurring chiefly as pyrolusite).	Breaking and grinding of manganese ore; sifting out of the refuse.	In the form of dust, through the respiratory organs.	MnO_2 produces cumulative effects. After protracted action of the toxin the symptoms begin with disturbances of the general sensibility, general debility, languor, lancinating pains in the extremities, in the small of the back and nape of the neck, creeping sensations in the legs and numbness in the feet; salivation; tremor of the head, tongue, and hands; later, locomotor disturbances with uncertain, stamping gait, and, ultimately, the impossibility of safe and sure progression. Affections of the voice (low, whispering) and of speech (indistinct, scanning) combined with flatness of tone; forced laughter and weeping and lowering of intelligence. Sometimes dropsical effusion into the cellular tissue of the lower extremities.
MERCURY, Hg: A silver-white, shining metal, unchangeable in the air, but evaporating at house temperature. **Mercury compounds, amalgams** (alloys with metals). **Cinnabar** (HgS) is nonpoisonous.	Mining and smelting of quicksilver; occupation of mirror plater, amalgam gilding and silvering; manufacture of thermometers, barometers, and manometers, incandescent electric lamps, Roentgen and Hittorf tubes, mercurial vapor lamps; manufacture of the salts of mercury, amalgams, and colors, pharmaceutic products, antiseptic dyes, inflammable materials, and explosives; employment of the salts of mercury, especially in the hare's fur business and felt-hat manufacture; photography and steel engraving.	Absorption through the uninjured skin; absorbed in the form of vapor and as dust (amalgam dust, dust of the compounds of mercury).	Industrial mercurial poisoning is a chronic poisoning occasioned by work in this metal for a long period, commonly weeks, months, years, or decades. The first symptom is generally increased ptyalism, with swelling and inflammation of the gums and of the buccal mucous membrane, often with the formation of rodent ulcers, besides, there are, frequently, disturbances of digestion, lassitude, and pallor. Associated with the further absorption of mercury, "erethism" supervenes—a peculiar psychic excitability (timorousness, bewilderment, irritability) aside from the characteristic mercurial tremor. In a state of complete repose this tremor is not noticeable, and manifests itself only on voluntary movement, causing a quite distinctive, irregular tremulousness of the fingers, hands, arms, and finally, also, of the legs and head. In strictly chronic cases the stomatitis and erethism are absent, and only the tremor is observable. Death may result in the worst cases in consequence of the violent tremor and spasms affecting the entire body; in other cases, increasing weakness. Cachexia.

Special measures of relief: Relinquishment of the employment; nutritious diet; vapor baths; potassium iodid.

METHYL ALCOHOL (wood spirit), CH_3OH: A colorless fluid, of faint odor.	Produced by the dry distillation of wood: used in the preparation of varnish, lacquer, polish, and perfumes; for the denaturing of spirits; for the production of coal-tar colors and pharmaceutical preparations; a solvent for anilin dyes in cotton print manufacture; used in combination with shellac for coating the interior of casks; in cabinet-making and furniture polishing.	Absorption through the digestive organs, also through the skin; in the form of vapor through the organs of respiration.	The effect is very persistent; nausea, headache, ringing in the ears, weakness of the muscles, insomnia, delirium, difficulty of breathing, and sometimes deafness; inflammation of the throat and the mucous membrane of the air passages extending to the finest ramifications of the bronchial tubes; finally, death by paralysis of the respiratory apparatus. Conjunctivitis; also serious affections of the retina and the optic nerve, resulting in blindness, even, from atrophy of this nerve.[1] In chronic cases, fatty degeneration of the liver.

Special measures of relief: The substitution of innocuous media for methyl alcohol in the denaturing of spirits.

[1] Permanent blindness and even a fatal issue may be caused by the ingestion of small quantites of wood spirit; hence the risk incurred in using cheap essences of vanilla and other flavoring extracts which contain methyl alcohol.—W. H. R.

Designation of the substance	Branches of industry in which poisoning occurs	Mode of entrance into the body	Symptoms of poisoning
METHYL BROMID, CH_3Br: A colorless, gaseous body of aromatic odor. **Methyl iodid, iodin methylate,** CH_3I: An ethereal, colorless fluid, of somewhat penetrating odor, soon becoming yellow on exposure to the air.	Employed in anilin dye factories.	In the form of gas, through the respiratory organs and the mucous membranes.	In mild cases, vertigo, headache, and transient stupor, with diplopia and a sensation of rigidity in the muscles of the eyes. In a severe case there was observed loss of consciousness continuing eight weeks, with staring look, pallor of the skin, retarded pulse, and obstinate constipation. During brief intervals of wakefulness there was unrest with increasing excitability. (Grandhomme.)
NITRANILIN, C_6H_4-NH_2NO_2: Forming long, yellow crystals. *See* Anilin.			
NITROBENZOL (mirbane oil, imitation bitter-almond oil), $C_6H_5NO_2$: A colorless, highly refractive fluid, having an odor like that of bitter almonds; and all nitro compounds of benzol and its homologues, *e.g.*, dinitrobenzol, dinitrochlorobenzol, nitrotoluol, nitrophenol, nitronaphthalene, etc. The most of the nitro and chloro compounds are the more poisonous.	Coal-tar color industry and those establishments in which its intermediate products are manufactured, as in explosives works, perfumery and soap factories, pharmaceutical laboratories, etc.	(1) Absorption takes place, first of all, through the skin, both the uninjured and especially the pathologically altered skin, particularly in the case of profuse perspiration; (2) through the respiratory organs; (3) through the digestive organs.	Poisoning by all of the designated substances is pretty nearly the same, qualitatively; quantitatively, however, differences exist, so that the larger proportion they contain of the nitro (NO_2) groups the more virulent they are likely to be. The nitrochloro compounds are very much more dangerous than the simple nitro compounds. The first toxic symptoms may appear within a few hours (8 to 24) after absorption of the poison. ACUTE POISONING.—(*a*) *In mild cases:* Malaise, headache, giddiness, nausea, loss of appetite, costiveness, burning sensation of the skin and mucous membrane. (*b*) *In severe cases:* A feeling of anxiety, disturbances of sensation, like formication on the legs and furriness of the soles of the feet, ringing in the ears; disturbances of co-ordination (reeling gait, stammering speech), increased excitability of the reflexes, convulsions and a state of general spasm; later, with decline of sensibility, symptoms of paralysis; vomiting; odor of the vomitus and of the exhaled breath like that of bitter-almond oil; icterus of the skin; at first increased, afterward diminished activity of the heart, with lowered tension of the pulse; visual derangements (amblyopia, optic neuritis); blood viscid, brown to deep dun color; diminution of the red corpuscles and alterations in their form; in the advanced cases, formation of methemoglobin. The course of severe cases is exceptionally varied; after intermissions, exacerbations may occur with a finally fatal result. Death may occur also in connection with deep insensibility, without other symptoms. The symptoms which point to blood changes predominate, in severe poisoning, over the nervous symptoms. SUBACUTE AND CHRONIC POISONING.—Icterical skin, which gradually becomes cyanotic; methemoglobin formation; symptoms of degeneration and regeneration of the red blood corpuscles; general debility, anemia. The clinical picture is similar to that of pernicious anemia. In the urine the poisoned corpuscles are sometimes demonstrable, and finally the presence of hematophorphyrin and of albumin.

Measures of relief: Immediate removal from the workroom; inhalation of oxygen; artificial respiration; eventually bloodletting; stimulants, nonalcoholic; prohibition of the use of alcoholic drinks during working hours; avoidance of the same, also, outside of employment.

Designation of the substance	Branches of industry in which poisoning occurs	Mode of entrance into the body	Symptoms of poisoning
NITROG LYCERIN, $C_3H_5O_3(NO_2)_3$ glycerin trinitrate: An oily, vaporable, colorless fluid, without odor.	Manufacture of explosives (dynamite, nitro-cellulose); in the use of dynamite.	Inhalation of the vapor; absorption through the uninjured skin, mucous membranes, and wounds of the skin. In the explosion of dynamite the action of carbon dioxid and nitrous monoxid, as well as that of undecomposed nitroglycerin is present.	Extraordinary toxicity, somewhat like effects of prussic acid; just a few drops are deadly, and even mere contact with products containing nitroglycerin may cause poisoning; severe headache, disturbance of the intellect, facile syncope, vertigo; burning in the throat and stomach; nausea, vomiting, colic; symptoms of paralysis in the muscles of the head and eyes, as well as in the lower extremities; bradycardia and retarded respiration, stertorous breathing and dyspnea; cyanosis; coldness of the extremities; injection of the conjunctiva; reddening of the countenance. *In the mixing and sifting of dynamite:* Obstinate ulcers under the nails and on the finger tips, eruption on the plantar aspect of the feet and interdigital spaces of both hands, with extreme dryness and formation of fissures. *Explosion of nitroglycerin with little gas:* Trembling, determination of blood to the head, vomiting, headache. *Explosion of nitroglycerin with much gas:* Vertigo, asphyxia, cyanosis, motor paralysis and loss of consciousness; intermittent, stertorous respiration, coldness of the skin, small pulse; after recovery of consciousness, debility, nausea, vomiting, headache, intermittent pulse, and finally death. CHRONIC POISONING.—Disturbances of digestion, trembling, neuralgia.

Special measures of relief: Absolute avoidance of contact.

NITRONAPHTHALENE, $C_{10}H_7(NO_2)$: A yellow, friable, crystalline mass of strongly aromatic odor. (*See* Nitrobenzol.)			

Designation of the substance	Branches of industry in which poisoning occurs	Mode of entrance into the body	Symptoms of poisoning
NITROUS GASES (low degrees of oxidation of nitrogen, which appear simultaneously): Nitrogen protoxid, NO; nitrogen deutoxid, NO_2; nitrogen trioxid, N_2O_3; anhydrous nitrous acid (HNO_2). Red fuming nitric acid is a saturated solution of N_2O_4 in crude NHO_3. NO is a colorless gas which under the influence of atmospheric oxygen, is readily transformed into brown nitrogen dioxid. Below −20° C. N_2O_3 is a blue fluid; at the ordinary temperature it separates into NO and NO_2.	Nitrous gases are produced by the action of nitric acid on deoxidating substances of various kinds, principally on metals (iron, lead, zinc, etc.), on organic substances (coal dust, wood, straw, paper, textile fabrics, woolen refuse, etc.) as well as many other substances (pyrites, sulphurous acid and its salts, soda, sediment, hydrochloric acid, iron chlorids, sulphate of iron, etc.); in the preparation of nitric acid, its combinations and salts, among which the nitrous salts also are to be included; metal etching and metal refining; stamp mills and mints; galvanotechnics; nitrification in chemical works and manufactories of explosives; celluloid manufacture; sulphuric acid manufacture; production of picric acid, anilin colors, nitrocellulose (gun cotton, collodion cotton), xyloidin, nitrostarch, nitro-jute dynamite, abelite, nitromannite, nitrosaccharose, viscosin, etc.; nitric acid manufacture and storage; preparations of thorium and cerium; bleaching materials (oils, etc.) hat making (maceration of the hair); etching and engraving on copper (etching of the plate); dyeing and printing (fixer and mordant).	In gaseous form, through the respiratory organs.	Susceptibility to the effects of nitrous gases fluctuates considerably. Persons who suffer from diseases of the respiratory organs are especially susceptible; not infrequently the continual inhalation of small quantities, for many consecutive years even, occasions no serious disturbances of the health. A pale, sallow complexion and chronic bronchial catarrh may be deemed, nevertheless, the usual consequences of occupational inhalation of very moderate quantities of nitrous gases. Often, however, larger quantities of the poisonous gases are borne for hours together (6 to 8 hours) without discomfort; when suddenly, after a long interval without disturbance, ominous symptoms appear. Symptoms of irritation in the air passages are manifest, as a feeling of constriction of the larynx, spasmodic cough, oppression in the chest, labored respiration, anxiety, cold perspiration on the face, protrusion of the eyes, gasping speech, paroxysms of coughing, bluish discoloration of the countenance, coldness of the extremities. Consciousness is at first unimpaired, but with increasing difficulty of breathing it becomes dimmed; injury to the teeth. The urine is scanty, brown in color, containing hemoglobin and albumin. Death results from edema of the lungs. In very severe cases methemoglobin is observed, and then a general systemic poisoning may result.

Special measures of relief: Immediate removal from the noxious atmosphere; inhalation of oxygen; finally, bloodletting and infusion of normal salt solution.

Designation of the substance	Branches of industry in which poisoning occurs	Mode of entrance into the body	Symptoms of poisoning
OXALIC ACID, $C_2H_2O_4$: It forms large, pellucid crystals.	Manufacture of oxalic acid; polishing of metals, especially of copper and brass utensils; used in dye works, chemical cleansing plants (rust and ink stains); straw hat manufacture and straw braiding.	In the form of dust, through the respiratory organs.	Opalescent or bluish discolorations (with brittleness) of the nails; blood stasis in the hands; corrosive action on the mucous membrane of the esophagus, of the stomach and bowel; weakness of the heart; convulsions and spasms. However, industrial poisonings by oxalic acid are exceedingly rare.
PETROLEUM: A mixture of various hydrocarbons of the methane, ethyl, and aromatic series.	Production of oil; refining of the crude oil; furniture polishing by use of so-called polishing oil.	In the form of vapor, through the respiratory organs. As a fluid it has a direct action on the skin.	The vapors of petroleum cause a profound acute poisoning with a condition of inebriation; shouting, reeling, and prolonged sleep without any recollection of what has happened; in severe cases, loss of consciousness, lividity of the countenance, staring look and contracted pupils, almost imperceptible pulse, asphyxia. The chronic effect of petroleum vapor causes numbness and irritation of the Schneiderian membrane. In general, the symptoms of the action of petroleum resemble those resulting from the action of benzin. By reason of the high boiling point of petroleum there are produced, in the extraction of paraffin butter, in the handling of crude paraffin, in the emptying of retorts, and in the filling of casks with petroleum, obstinate inflammations of the hand in the form of acne (nodules, pustules, and boils).

Special measures of relief: Removal into the fresh air; in collapse, a tepid bath with cold affusions; subcutaneous injections of camphorated oil.

PHENOL, C_6H_5OH (carbolic acid): A white crystalline mass, and its homologues, *e.g.*, cresol, lysol, and their derivatives.	Anthracite coal tar distillation; production of picric acid and of many organic aromatic compounds; used in dyeing, calico printing; manufacture of lampblack, in photogen factories; impregnating wood with tar and oil of tar; surgical dressing industry.	Action on the epidermis and the digestive tract.	Erosion of the skin, which by great extension may lead to severe internal injuries; symptoms of degeneration in the blood and in the internal organs (nephritis); gangrene, icterus, collapse.
PHENYLHYDRAZIN, C_6H_5NH-NH_2: A yellowish, oily fluid, shading into brown, of pungent odor.	A by-product in the manufacture of antipyrin from anilin; manufacture of organic compounds.	Absorption by the skin; action on the skin.	Obstinate vesicular eruption on the skin, with itching and burning; diarrhea, loss of appetite; granular degeneration of the blood corpuscles; formation of methemoglobin; a sense of general malaise.

Designation of the substance	Branches of industry in which poisoning occurs	Mode of entrance into the body	Symptoms of poisoning
PHOSGENE, $COCl_2$ (carbon oxychlorid): A colorless gas, of suffocating odor.	In the manufacture of phosgene and its use for the production of organic compounds.	In the form of vapor, through the respiratory organs.	Until the present time only the acute form of poisoning has been recognized. The first symptoms of illness sometimes appear only after many hours. By means of the hydrochloric acid arising from the decomposition of the gases in the lungs, destruction of lung tissue results, with difficulty of breathing, paralysis of the lungs, and pulmonary edema. A fatal outcome is often observed.

Special measures of relief: Inhalation of oxygen and medical attendance immediately after breathing the phosgene gas.

Designation of the substance	Branches of industry in which poisoning occurs	Mode of entrance into the body	Symptoms of poisoning
PHOSPHORUS, P: A colorless, transparent substance; on exposure to the light, translucent and of a yellowish, waxy luster. In the air it is luminous, and when heated in closed iron crucibles to a temperature ranging from 250° to 300°C. it is converted into red or amorphous phosphorus, which is unaffected by the air. The yellow or white phosphorus is very poisonous; the red, nonpoisonous.	Extraction of phosphorus from phosphorites and coprolites, bone-black (refuse of sugar mills), bone-ash (refuse of meat extract manufacture); production of phosphor-bronze, of phosphorus compounds, igniting agents, matches, and tar colors.	In the form of vapor, through the respiratory organs; into the digestive canal by means of food contaminated by the fingers; action on the skin.	As industrial poisoning it occurs only in the chronic form, occasioned by the absorption of very minute particles of the poison for a period of months, generally, indeed, of years. Symptoms of the disease sometimes first appear long after relinquishment of the occupation. It is doubtful whether chronic phosphorism occurs (that is, general systematic poisoning by phosphorus). Chronic phosphorus poisoning uniformly affects the bones of the face, beginning with inflammation and sclerosis of the bones and of the periosteum; then, by extension of the suppurative process, necrosis results. This most frequently attacks that portion of the alveolar process of the jawbone which is least protected against infection. Swelling and ulcerations on the gums and the buccal mucous membrane, pain even in the sound teeth, loosening and falling out of the teeth, infiltration of board like hardness occurs in the soft parts surrounding the jaw; suppuration and destruction of the jawbone (necrosis) with numerous fistulous channels which here and there burrow through the cheek. Hand in hand with the ulcerative processes go osteoplastic formations, so that, while suppurative destruction of tissue takes place at one point, at another the formation of new bone is going on. The under jaw is more often affected than the upper; here the process goes on insidiously without formation of new bone but with local destruction of the part. The palatal and orbital bones may be attacked with ulceration and shrinking of the eyeball. By extension of the inflammation along the sheaths of the vessels there result meningeal inflammation and cerebral abscess. There is remarkable brittleness of the bones, decline of appetite, pallid complexion, diarrhea, emaciation. Sometimes there is amyloid degeneration of the abdominal organs. Death by sepsis.

Special measures of relief: To the utmost possible extent the prohibition of the use of white or yellow phosphorus; exclusion of laborers that have dental caries, after extraction of a tooth at least two weeks' exclusion from the employment; change of occupation; improvement of the general health; there is no specific medical treatment; in appropriate cases, operative intervention.

Designation of the substance	Branches of industry in which poisoning occurs	Mode of entrance into the body	Symptoms of poisoning
PHOSPHORUS SESQUISULPHID, P_2S_3: A grayish yellow, odorless and tasteless substance.	In chemical factories.	Inhalation of sulphuretted hydrogen in the fusion of phosphorus and sulphur as well as in the drawing off of the molten mass from the kettles; dust in the grinding and sifting of the paste; bicarburet of sulphur vapors in the extraction of yellow phosphorus and regeneration of CS_2.	Irritation of the mucous membranes, especially obstinate conjunctivitis. Through the influence of dust in the grinding and sifting of the composition there appear symptoms of CS_2 poisoning. To be noticed also is the danger of poisoning by sulphuretted hydrogen (*See under* Sulphuretted hydrogen.)

Special measures of relief: Prevention of the contamination of phosphorus sesquisulphid with yellow phosphorus; precautions against injury from the effects of sulphuretted hydrogen.

PHOSPHURETED HYDROGEN, PH_3: A colorless gas of nauseating odor.	In the extraction of phosphorus; in the preparation of red phosphorus and the sesquisulphid of phosphorus; in the reduction of iron silicate containing phosphorus by the action of moisture; in the production of acetylene with calcium carbid that contains an admixture of calcium phosphate.	In the form of gas, through the respiratory organs.	An anxious, oppressed feeling in the chest, changing to a burning, lancinating pain; affections of the head, vertigo, tinnitus aurium; general debility; loss of appetite; great thrist. Death occurs without convulsions, through the effect of the poison on the blood.
PICRIC ACID, $C_6H_2(OH)(NO_2)_3$: Trinitrophenol in a pure state forms pale yellow, bitter tasting, foliate, metallic crystals.	Chemical works, dyehouses; manufacture of explosives and powder (lyddite, melinite); projectile factories, filling shops.	In the form of dust, through the respiratory passages; direct action on the skin.	Poisonings with picric acid are rare; when they occur there are itching, inflammation of the skin, vesicular eruption, yellow pigmentation of the epidermis and of the conjunctiva, inflammation of the buccal mucous membrane, bitter taste, disturbances of digestion, epigastric pain, nausea, vertigo, diarrhea, and jaundice; picric acid decomposes the constituents of the blood. By the penetration of dust into the nostrils, sneezing and nasal catarrh are occasioned.
PYRIDIN, C_5H_5N: A colorless fluid of pungent and characteristic odor. Its homologues, pyridin bases.	In its manufacture out of coal tar and bone tar; in the use of denaturing spirits (shops for woodworking, gilding, and hat manufacture).	In the form of vapor, through the respiratory organs. In a fluid state it acts on the skin of the hands and arms.	Catarrh of the mucous membranes; hoarseness, irritation, and choking sensation in the throat; headache, vertigo, flaccidity and trembling of the extremities; difficulty of breathing and clonic convulsions; eczema of the hands. Industrial poisoning by pyridin is very rare.
SULPHUR CHLORID, S_2Cl_2: A thickish fluid, of brownish color and suffocating odor, fuming on exposure to the air.	Solvent for sulphur and fats; caoutchouc and patent rubber industry.	In the form of vapor, through the respiratory organs.	In contact with water and atmospheric moisture, it is resolved into hydrochloric acid vapor. The vapor of sulphur chlorid is suffocating; if ingested, it excites vomiting.

Special measures of relief: Wearing of rubber gloves; instant removal of the patient from the poisonous atmosphere.

Designation of the substance	Branches of industry in which poisoning occurs	Mode of entrance into the body	Symptoms of poisoning
SULPHUR DIOXID, SULPHUROUS ACID, (H_2SO_3): Its anhydrid is SO_2, in the form of gas; condensed, it becomes fluid. The gas is of pungent odor and suffocating effect.	Roasting of sulphur-bearing ores; brick works, ceramic industry; manufacture of sulphuric acid, of ultramarine; extraction of bones, manufacture of glue and gelatine from bones; disinfection; refining of petroleum; manufacture of candles; bleaching of wax, silk, and wool; chromium tanning (two-vat process); bleaching of straw hats and bristles; preserving wine and fruits; fumigating hops and casks with sulphur; ice machines; heating plants (burning of pyrite-bearing coal).	In the form of gas, through the respiratory organs.	In moderate concentration sulphurous acid is borne without inconvenience or injury; persons accustomed to the gas bear very well a proportion of 0.003 to 0.004 per cent. of SO_2 in the air. Susceptible persons, at the beginning of their employment in an atmosphere containing sulphurous acid, manifest a transient irritation of the mucous membrane of the respiratory organs and of the eyes. In its severe action there is spasmodic cough with secretion of tenacious, often blood-tinged, mucus. The protracted effect of a high degree of concentration is livid discoloration of the mucous membranes, bronchial catarrh, croupous angina of the bronchi and their branches, and inflammatory areas in the lungs; disturbances of digestion.

Special measures of relief: Removal from the noxious atmosphere; admission of fresh air; artificial respiration; infusion of weak alkaline solutions (0.05 to 0.1 per cent. liquor natrii caustici [*solution of caustic soda*]).

SULPHURETED HYDROGEN, or **HYDRIC SULPHID,** H_2S: A colorless gas, having the fetid odor of rotten eggs.	Blast furnace plants, in granulating the slag; distillation of sulphur waters; ultramarine works; Leblanc soda and chemical factories; in the manufacture of the compounds of sulphur and phosphorus; sulphur metals (manufacture and use); sulphid of soda and sulphid of barium industry (manufacture of sulphid colors and dyeing with these); the extraction of cellulose (straw and wood); in the waste waters of industries which make use of organic substances; sedimentation tanks of sugar works; precipitation of soda residua containing calcium sulphid; work in sewers, latrines, and dung pits; illuminating gas plants; flax retteries; tanneries.	In the form of gas, through the respiratory organs, as pure hydric sulphid gas; often found in admixture with other gases (with CO_2, N, NH_4, and carburetted hydrogen); direct action on the conjunctiva.	In the less violent cases there are gastric distress, nausea, fetid eructations, irritation and inflammation of the conjunctiva; rarely, erosion of the cornea, formation of vesicles on the lips, irritating cough, headache, and a sensation of giddiness. In long continued inhalation convulsions and paralyses occur. In severe cases there are contraction of the pupils, slowing of the pulse, Cheyne-Stokes respiration, nystagmus, trismus, and tetanus. With a very high proportion of sulphuretted hydrogen in the air a man suddenly falls, becomes unconscious, and dies without convulsions (apoplectic form). CHRONIC POISONING.—Conjunctival catarrh; a sense of pressure in the head and on the chest; headache, debility, vertigo, nausea, disturbances of digestion; sallow complexion and emaciation; slowing of the pulse; tendency to the formation of boils.

Special measures of relief: Before emptying of dung pits and the like, their contents should be thoroughly mixed with iron sulphate (5 kg. pro 1 cbm.); the emptying should be effected by mechanical apparatus; safety ropes to be attached to the workmen; prompt hoisting out of the unconscious workmen; removal of the soiled clothing; artificial respiration; administration of oxygen; hypodermics of ether or camphor.

Designation of the substance	Branches of industry in which poisoning occurs	Mode of entrance into the body	Symptoms of poisoning
SULPHURIC ACID, H_2SO_4: A colorless, odorless, thick, oily fluid.	Manufacture of sulphuric acid; accumulator factories (mold and charging rooms); burnishing of iron, steel, etc.; textile industry, hat factories; petroleum distillation; factories for the manufacture of powdered fertilizers.	In the form of vapor, through the respiratory organs.	Inflammatory diseases of the respiratory organs (acute and chronic catarrh), inflammation of the lungs; anorexia; decalcification of the bones (according to Lewin); injury to the teeth through softening of the dentin. As a result of the bespattering of the skin with concentrated H_2SO_4 there is severe pain, a whitish discoloration of the skin, becoming brownish, with reddening and swelling of the surrounding tissues; in cases of extensive scalds there are, ultimately, decomposition of the blood, formation of ulcers of the duodenum, somnolence, and even death.
TAR: A product obtained by dry distillation, particularly of anthracite coal and lignite.	Manufacture of illuminating gas; coke ovens; tar works; tar product factories; plants for wood preserving; manufacture of roofing paper; use for concrete paving; painting of metals; as a fuel; briquet factories.	It acts on the skin; in the form of vapor, on the respiratory organs.	Tar itch under the form of diffuse acne, eczema or psoriasis, primarily on the upper extremities, later, also, on the other parts of the body; not infrequently on the irritated portions of the skin there appear cancroid ulcers, especially of the scrotum (among chimney sweepers, paraffin and soot workers and briquet makers). Together with the effect on the greater portion of the skin, there are also general symptoms: Loss of appetite, nausea, diarrhea, headache, numbness, vertigo, besides disturbances of the urinary bladder (ischuria, strangury), also albuminuria and edema.
TURPENTINE OIL: A mixture of various terebinthin hydrocarbons, $C_{10}H_{16}$, differing in odor and in composition according to the botanical species from which they are severally derived.	Manufacture of varnish, cement, lacquer, sealing wax, colors; tapestry printing; trade of decorator, lacquerer, and house painter; as a cleansing agent in various industries.	In the form of vapor, it acts upon the mucous membranes; in a fluid state, it acts on the epidermis.	Irritation of the mucous membrane of the eyes, of the nose (coryza), and of the upper air passages (hemming, cough, bronchial inflammation); salivation; besides, there are insensitiveness, giddiness, headache. Prolonged action of the oil causes irritation of the kidneys, and then these organs excrete urine having the odor of violets. Severe irritation of the skin is excited, especially by the so-called pine oil (Russian oil of turpentine).

LIST OF INDUSTRIES IN WHICH POISONING MAY OCCUR

(From Diseases of Occupation and Vocational Hygiene, Kober and Hanson)

Branches of industry in which poisoning may occur	*Designation of industrial poison*
Abelite, manufacture of	Nitrous gases
Accumulator, electrical works	See Batteries, storage
Acetate of lead, manufacture of	Lead
Acetylene production (if calcium carbid contains admixture of calcium phosphate)	Phosphuretted hydrogen
Acids, commercial manufacture of	Arsenic
Acid, hydrochloric, manufacture of	Hydrochloric acid
Acid, hydrofluoric, manufacture of	Hydrofluoric acid
Acid, muriatic, manufacture of	Hydrochloric acid
Acid, picric, manufacture of	Picric acid
Acid, stearic, manufacture of	Acrolein
Acid, sulphuric, manufacture of	Nitrous gases, sulphur dioxid
Acid, valeric, manufacture of	Amyl alcohol
Air pollution	Carbon dioxid, carbon monoxid
Alcohol, denatured	Benzol, methyl alcohol, pyridin
Alkaloids, manufacture of	Benzol
Amber workers	Lead
Amalgam	Mercury
Ammonia salts, manufacture of	Ammonia
Ammunition, manufacture of	Acrolein, antimony, lead (see also "Explosives")
Amid compounds of benzol, etc.	Anilin
Amyl nitrite, manufacture of	Amyl alcohol
Anatomical preparations	Formaldehyd, phenol
Anilin color dye factories: Anilin orange, aurantia, saffron yellow, Manchester yellow, Meldola dyes, corvulin, Bismarck blue, indulin, fast black	Anilin, arseniuretted hydrogen, antimony, hydrochloric acid, methyl bromid, nitrobenzol, nitrous gases
Antimony alloys, and extraction of	Antimony, lead
Antiseptic dressing, manufacture of	Mercury, phenol
Antipyrin, manufacture of	Benzin, phenylhydrazin
Arsenic acid, manufacture of	Arsenic, arseniuretted hydrogen
Arsenic mining	Arsenic
Arsenical ores, smelting	Arsenic
Artificial flowers and leaves	Arsenic, lead
Artificial ice and cold storage	Ammonia
Asphalt, testing	Carbon disulphid
Aurantia dyes	Anilin dyestuffs
Automobilists	Carbon monoxid, benzin
Babbitting metal, and solder	Lead
Bakers and confectioners	Carbon dioxid, carbon monoxid
Balloon filling with impure hydrogen gas	Arseniuretted hydrogen
Barium sulphid, manufacture of	Sulphuretted hydrogen
Barometers, manufacture of	Mercury

LIST OF INDUSTRIES IN WHICH POISONING MAY OCCUR (*Continued*)

Branches of industry in which poisoning may occur	*Designation of industrial poison*
Batteries, storage, dry, manufacture of	Benzol, creosote, hydrochloric acid, sulphuric acid, lead, mercury, pitch, zinc chlorid
Batteries, storage, wet, manufacture of	Chromium compounds
Beet sugar, manufacture of	Ammonia, sulphuretted hydrogen
Benzin plants	Benzin
Benzol	Benzol.
Bicycles, manufacture of	Amyl acetate
Bismarck blue, manufacture of	Anilin dyestuffs
Bismuth, manufacture of	Arsenic
Black anilin colors	Anilin dyestuffs
Blacksmiths	Acrolein, carbon monoxid, cyanogen compounds
Blast furnace workers	Carbon monoxid, cyanogen compounds, lead fumes, if lead is present in iron ore, sulphur dioxid, sulphuretted hydrogen (in granulating slag)
Bleacheries	Chlorin, sulphur dioxid
Bleaching agents, manufacture of	Nitrous gases
Bleaching agents, for bristles, cane, silk, straw hats, wax and wool	Sulphur dioxid, chlorid of lime
Bleaching agents for cotton, linen and paper	
Bleaching agents for cane and extraction of its silicates	Hydrofluoric acid
Bleaching agents for fats, oil and wax	Chlorin, chromium compounds
Bone ash, refuse of meat extract	Phosphorus
Bone-black, refuse of sugar refineries	Phosphorus
Bone-black, manufacture of	Ammonia, phosphorus
Bone, extraction of	Sulphur dioxid
Bone, rendering plants	Acrolein, benzin
Bone tar, manufacture of	Pyridin
Bookbinders	Carbon monoxid, methyl alcohol
Boot and shoe industry	Benzin, methyl alcohol, lead, mercury
Bottle caps and capsules	Lead
Box and card factories	Arsenic, chrome and lead compounds
Brasiers	Carbon monoxid
Brass etching	Arsenic chlorid
Brass instruments, musical	Lead
Brass foundries	Antimony, benzin, carbon dioxid, carbon monoxid, lead, phosphorus, sulphur dioxid, zinc fumes
Brass polishing	Lead, oxalic acid, sulphuric acid
Brass lacquer	Amyl acetate, methyl alcohol
Breweries, fermentation rooms	Carbon dioxid
Breweries, fumigation of vats, and disinfection	Sulphur dioxid, zinc oxid
Breweries, shellacing casks	Methyl alcohol
Brick kilns, brick and tile makers	Carbon dioxid, carbon monoxid, sulphur dioxid, lead glaze

LIST OF INDUSTRIES IN WHICH POISONING MAY OCCUR (*Continued*)

Branches of industry in which poisoning may occur	*Designation of industrial poison*
Briquet factories for fuel	Tar
Britannia metal	Antimony
Bronze workers	Antimony, lead, zinc, arsenic, acids, phosphorus
Bronzing with nitrate of mercury	Mercury
Brown mineral mills	Manganese
Brunswick green	Arsenic
Brush makers	Anthrax, lead, methyl alcohol, tar (see also bleaching)
Bullets, dipping	Acrolein
Bullets, manufacture of	Antimony, lead
Burnishing of iron and steel	Antimony, sulphuric acid
Cable wire, manufacture of	Carbon disulphid, lead
Cabinet makers	Anilin stains, chrome lead stains
Caoutchouc solvent and refining of	Benzol, carbon disulphid, sulphur chlorid
Caisson work	Carbon dioxid
Calcining dolomite, etc.	Carbon dioxid, carbon monoxid
Calico printing	Anilin, chromium, cyanogen and chlorin compounds, hydrochloric acid, lead, methyl alcohol, phenol, antimony, arsenic, carbon monoxid
Candles, manufacture of	Sulphur dioxid
Cane factories	Anilin stains, chlorin, chlorid of lime, hydrofluoric acid, methyl alcohol, sulphur dioxid
Canning industry	Carbon monoxid, lead, acid fumes, sulphur dioxid
Carbolic acid	Phenol
Carbonated waters	Carbon dioxid
Carbon chlorid, manufacture of	Carbon disulphid
Carbon sulphurate, manufacture of	Carbon disulphid
Carbonizing of materials	Acid fumes and arseniuretted hydrogen
Carpet cleaning	Benzin
Carpet dye	Arsenic
Cassel green	Arsenic
Celluloid manufacture	Acetaldehyd, anilin and lead colors, cyanogen compounds, methyl alcohol, nitrous gases, sulphuretted hydrogen
Cellulose, extraction from straw and wood	Nitrous gases, sulphuretted hydrogen
Cements	Turpentine, benzin
Ceramic industry	Hydrofluoric acid, lead, sulphur dioxid (see also Potteries)
Cerium, preparation of	Nitrous gases
Chair factories, polishing	Methyl alcohol, petroleum (see also Rattan Industry)
Chalk, colored	Arsenic
Charcoal burning	Carbon monoxid
Chemical cleansing establishments	Benzin, benzol

LIST OF INDUSTRIES IN WHICH POISONING MAY OCCUR (*Continued*)

Branches of industry in which poisoning may occur	*Designation of industrial poison*
Chemical cleansing removal of ink and rust stains	Oxalic acid
Chemical industry	Ammonia, anilin, carbon disulphid, chlorin, cyanogen compounds, hydrochloric acid, methyl compounds, nitrous gases, nitrobenzol, phosphorus sesquisulphid, picric acid, sulphur dioxid, carbon monoxid, etc.
Chlorid of lead	Lead
Chlorid of lime, manufacture of	Chlorin, arseniuretted hydrogen
Chlorinating process	Chlorin
Chlorin, organic products	Chlorin
Chloroform manufacture	Chlorid of lime
Chromate of lead	Chromium, lead
Chromate tanning	Chromium compounds
Chromium colors and preparations	Chromium compounds
Chromo-lithography	Arsenic, brass, chromium, lead, nitrous gases in etching, turpentine
Christmas ornaments, manufacture of	Arsenic
Chrysoidin fast black, manufacture	Anilin dyestuffs
Church crosses, gilding	Mercury
Cinnabar	Mercury
Cleaning, dry	Benzin, benzol
Coal mines	Carbon dioxid, carbon monoxid (see mining)
Coal oil	Petroleum
Coal-tar anthracite distillation	Phenol, pyridin, tar
Coal-tar color industry	Anilin, formaldehyd, methyl alcohol, nitro-benzol, nitrous gases
Cochineal	Arsenic
Coke ovens	Ammonia, carbon monoxid, tar
Collodion cotton	Nitrous gases
Commercial acids, impure	Arsenic
Colors, manufacture of for paints, etc.	Benzin, benzol, chromium compounds, arsenic, lead, mercury, turpentine
Colored chalk	Arsenic
Colored lights	Arsenic, antimony
Colored paper	Arsenic, chromium, lead compounds
Colored pencils	Anilin dyestuffs
Combs, horn-celluloid	Acetaldehyd, acid fumes, anilin, lead colors (see also Celluloid)
Compositors	Lead, antimony, arsenic, benzin
Concrete paving	Tar
Coopers	Methyl alcohol shellac
Copper plate etching and engraving	Nitrous gases
Copper polishing	Oxalic acid
Copper smelting	Arsenic, carbon monoxid, sulphur dioxid
Copper workers	Arseniuretted hydrogen, lead, nitric and sulphuric acid fumes

LIST OF INDUSTRIES IN WHICH POISONING MAY OCCUR (*Continued*)

Branches of industry in which poisoning may occur	*Designation of industrial poison*
Corvulin dye	Anilin dyestuffs
Cowper apparatus	Carbon monoxid
Creasote, cresol	Phenol
Cumol	Benzol
Cutlery industry	Carbon monoxid, acid fumes, lead (see also Brass, Tempering, Tinning)
Decorators and painters	Arsenic, benzin, chromium compounds, lead, mercury, methyl alcohol turpentine
Decomposition gases	Ammonia, carbon dioxid, sulphuretted hydrogen
Denaturing of spirits	Methyl alcohol, pyridin
Dentists	Mercury
Deoxidating processes	Nitrous gases
Diamond cutting and setting of precious stones	Lead, carbon monoxid
Dinitrobenzol, manufacture of	Nitrobenzol
Dinitrochlorobenzol, manufacture of	Nitrobenzol
Dinitro-compounds, manufacture of	Nitrobenzol
Dip for scabby sheep	Arsenic
Disinfection	Carbon disulphid, chlorin, chlorid of lime, cyanogen compounds, formaldehyd, mercury bichlorid, phenol, sulphur dioxid
Distilleries	Carbon dioxid, sulphuretted hydrogen, sulphur dioxid
Dolomite calcining	Carbon dioxid, carbon monoxid
Drying processes by means of open fires	Carbon monoxid
Dung pits	Ammonia, sulphuretted hydrogen
Dyes, antiseptic	Mercury
Dyes, organic, manufacture of	Acridin
Dyestuffs	Ammonia, chlorid of lime (see also Anilin Dyestuffs)
Dyeing and printing, fixer and mordant	Nitrous gases
Dyeing and dye works	Antimony, arsenic, anilin dyestuffs, benzol, chromium compounds, cyanogen compounds, hydrofluoric acid, phenol, oxalic acid, picric acid, sulphuretted hydrogen (dyeing with sulphid colors), ammonia, lead, methyl alcohol
Dynamite, manufacture of	Nitrous gases, nitroglycerin
Electrical accumulator works	See Batteries
Electric lamps, manufacture of	Lead, mercury
Electric lamps, incandescent wire	Amyl acetate
Electric line workers	Carbon monoxid, solder
Electric meters	Mercury, lead (see also Brass Industry)
Electroplating	Cyanogen compounds

LIST OF INDUSTRIES IN WHICH POISONING MAY OCCUR (*Continued*)

Branches of industry in which poisoning may occur	*Designation of industrial poison*
Electrotyping	Antimony, arsenic, lead, carbon monoxid
Emery wheels, babbitting of	Lead
Enamelling works	Hydrochloric acid, lead, benzin, carbon monoxid
Engraving, steel	Mercury
Essences, fruit, artificial	Amyl alcohol
Etching on brass	Arsenic chlorid, nitrous gases
Etching on metals	Arseniuretted hydrogen, mercury, nitrous fumes, chlorin, phosphoric acid
Ether, methyl	Dimethyl sulphate
Ethyl violet	Anilin dyestuffs
Extraction of antimony	Antimony
Extraction of bone	Sulphur dioxid
Extraction of gold and silver	Cyanogen compounds, mercury
Explosives, manufacture of	Anilin dyestuffs, mercury, nitrous gases, nitro-benzol, nitroglycerin, picric acid
Farmers	Carbon dioxid in silos (see also insecticides)
Fats, bleaching of	Chromium compounds
Fats, extractions of	Benzin, benzol, acrolein, carbon disulphid
Fats, solvents	Benzol, benzin, carbon disulphid, sulphur chlorid
Faucets, brass, polishing	Lead
Feathers, ornamental	Benzin
Fermentation rooms	Carbon dioxid
Felt hat industry	Mercury, methyl alcohol, nitrous gases, sulphuric acid, nitric acid, arsenic dyestuffs, carbon monoxid
Ferrosilicon	Arseniuretted and phosphuretted hydrogen
Fertilizers, artificial manufacture of	Hydrochloric acid, hydrofluoric acid, sulphuric acid, sulphuretted hydrogen, benzin
File cutting	Lead
Fireworks	Antimony, arsenic, carbon monoxid, phosphorus
Firearms, manufacture of	Antimony, carbon monoxid, nitrous gases
Firemen	Benzin, carbon monoxid, nitrous and other acid fumes
Flasks, manufacture of	Lead
Flax retteries	Sulphuretted hydrogen
Flowers, artificial	Arsenic, lead
Foundries, iron	Carbon monoxid, sulphuric acid
Fluoric acid	Hydrofluoric acid
Fluorides, extraction of	Hydrofluoric acid
Fruit essences, manufacture of	Amyl alcohol
Fruit, dried, preservation	Sulphur dioxid
Fuel briquet factories	Tar
Fumigation casks, hops, fruit	Sulphur dioxid

LIST OF INDUSTRIES IN WHICH POISONING MAY OCCUR (*Continued*)

Branches of industry in which poisoning may occur	*Designation of industrial poison*
Furnace gases	Carbon monoxid, sulphur dioxid (see also Blast Furnaces)
Furniture factories, staining and polishing	Anilin, arsenic, chrome stains, lead, methyl alcohol, petroleum, phenol, turpentine
Furriers	Lead for dyeing; mercury and nitrous gases for rabbit fur, arsenic, anthrax
Galvano-plasty	Cyanogen compounds
Galvano-techniques	Nitrous gases
Galvanizing with zinc or tin	Ammonia, arseniuretted hydrogen, hydrochloric and sulphuric acids, zinc
Garage workers	Benzin, carbon monoxid
Garbage fat extraction	Benzin
Gardeners	See Insecticides
Garment workers	Anilin and arsenic dyes, carbon monoxid from ironing stoves, lead from weighted silk
Gas plants	Ammonia, carbon monoxid, cyanogen compounds, tar
Gas and steam fitters	Arseniuretted hydrogen, lead, nitrous gases
Gas machines	Carbon monoxid
Gas purification	Carbon monoxid, cyanogen compounds
Gasolin	Benzin
Gelatin manufacture	Sulphur dioxid
Gilding and silvering	Mercury
Glass etching	Hydrofluoric acid
Glass factories	Arsenic, hydrofluoric acid, hydrochloric acid, chromium compounds, carbon monoxid, lead, manganese, phenol (see also Painter)
Glass polishing	Lead
Glaze mixing and dipping	Lead
Glove and mitten manufacture	Anthrax, acids, anilin, chrome and lead compounds
Glove cleaning	Benzin
Glucose, manufacture of	Arsenic from impure sulphuric acid
Glue, manufacture of	Sulphur dioxid, chlorid of lime
Glycerin, trinitrate	Nitroglycerin
Gold, extraction of	Cyanogen compounds, mercury
Gold plating	Cyanogen compounds
Grease removal	Benzin, benzene, carbon disulphid
Gums, solvent for	Carbon disulphid
Gun cotton	Nitroglycerin, nitrous gases
Gunsmiths	Antimony, cyanogen compounds, carbon monoxid
Hair industry	Anthrax
Hardening and tempering steel magnets, piano wire, springs, files, etc.	Acrolein, cyanogen compounds and lead
Hat, felt, factory	Mercury, methyl alcohol, nitrous gases, sulphuric acid, arsenic, dyestuffs, carbon monoxid

LIST OF INDUSTRIES IN WHICH POISONING MAY OCCUR (*Continued*)

Branches of industry in which poisoning may occur	*Designation of industrial poison*
Hat, straw, factory	Sulphur dioxid, methyl alcohol, oxalic acid
Heating and power plants	Carbon dioxid, carbon monoxid
Hectograph composition	Chromium compounds, anilin
Hides and skins	Anthrax, arsenic, sulphur dioxid (see also Tanning)
Hittorf tubes	Mercury
Hydrochloric acid	Nitrous gases
Hydrogen gas	Arseniuretted hydrogen
House painting	Arsenic, benzin, lead, chrome colors, methyl alcohol, turpentine
Ice machines	Ammonia, sulphur dioxid
Igniting agents	Phosphorus
Illuminating gas, manufacture of	Ammonia, benzol, carbon monoxid, carbon disulphid, sulphuretted hydrogen, tar
Imitation bitter-almond oil	Nitrobenzol
Imitation silk factories	Carbon disulphid, ammonium sulphid, nitrous fumes
Imperial yellow dye, manufacture of	Anilin dyestuffs
Impregnated wood	Phenol, tar
Incandescent electric light	Amyl acetate, carbon monoxid, mercury, methyl alcohol
India rubber industry	Anilin oil, antimony, benzin, benzol, carbon disulphid, cinnabar (mercury), hydrochloric acid, lead, sulphur dioxid and chlorid, tar, wood, alcohol.
Indian white fire	Arsenic
Indulin dye, manufacture of	Anilin dyestuffs
Ink stains, removal of	Oxalic acid
Insecticides, manufacture and use of	Arsenic, carbon disulphid, cyanogen and mercury compounds, sulphur dioxid
Insulated wire, manufacture of	Carbon disulphid, lead
Iodin, manufacture of	Benzol
Iron chlorid, sulphate, manufacture	Nitrous gases
Iron, deoxidation of	Nitrous gases
Iron, galvanizing with zinc or tin	Ammonia, arseniuretted hydrogen, acid fumes and zinc
Iron silicate, impure, decomposition of	Arseniuretted and phosphuretted hydrogen
Iron sulphate, manufacture of	Arseniuretted hydrogen
Ironing	Carbon monoxid, chlorin, arsenic
Iron sanitary ware	Carbon monoxid, lead, acid fumes
Iron and steel workers	Carbon monoxid, other furnace gases (see also Cutlery Industry)
Jewelry, manufacture of	Ammonia, amyl acetate, cyanogen compounds, lead solder, hydrochloric, nitric and sulphuric acids, mercury, carbon monoxid (see also Brass)
Kaiser green	Arsenic

LIST OF INDUSTRIES IN WHICH POISONING MAY OCCUR (*Continued*)

Branches of industry in which poisoning may occur	*Designation of industrial poison*
Krems white	Lead
Lace workers	Carbon monoxid
Lacquer manufacture	Ammonia, amyl acetate, benzin, benzol, methyl alcohol, turpentine
Lampblack, manufacture	Phenol
Lamp shades, coloring purposes	Arsenic
Lanolin, extraction of	Carbon disulphid
Lard making	Acrolein, ammonium sulphid, acid fumes
Latrines	Ammonia, sulphuretted hydrogen
Laundries	Benzin, benzol, chlorin, anilin colors for marking ink, carbon monoxid, arsenic from coke burning ironing stoves
Lead alloys	Antimony, copper, tin, etc.
Lead colors	Lead
Lead, deoxidation of	Nitrous gases
Lead metal	Arsenic
Lead smelting	Antimony, arsenic, lead, sulphur dioxid
Lead plating	Arseniuretted hydrogen
Leaf metal workers	Ammonia, amyl acetate, acetone, benzin, benzol, methyl alcohol, turpentine
Leather industry	Arsenic, chromium compounds, lead, mineral acids
Leather sole stitching	Mercury
Leather patent	Amyl acetate, benzin, methyl alcohol
Leblanc soda, manufacture	Sulphuretted hydrogen
Ligroin	Benzin
Lime chlorid, manufacture of	Chlorin, arseniuretted hydrogen
Lime kilns	Carbon dioxid, carbon monoxid, sulphur dioxid
Linoleum, manufacture of	Acrolein, amyl acetate, arsenical, mercurial and lead pigments, benzin and turpentine, manganese, zinc oxid
Linotyping	Antimony, arsenic, lead, organic vapors
Litharge	Lead
Lithographing	Arsenic, acid fumes, bronze powder, anilin, benzin, turpentine
Litho-transfer work	Lead
Lyddite, manufacture of	Picric acid
Lysol	Phenol
Manchester yellow, manufacture of	Anilin dyestuffs
Manganese mills	Manganese
Manumeters, manufacture of	Mercury
Marble polishers	Lead
Masonic white leather aprons	Lead
Mattress, manufacture of	Anthrax, infectious diseases
Matches, manufacture of	Chromium compounds, phosphorus
Meldola dyes	Anilin dyestuffs
Melinite, manufacture of	Picric acid
Mercury compounds, manufacture of	Mercury
Mercury mining	Mercury

LIST OF INDUSTRIES IN WHICH POISONING MAY OCCUR (*Continued*)

Branches of industry in which poisoning may occur	*Designation of industrial poison*
Mercury smelting	Mercury
Mercury vapor lamps	Mercury
Metal dipping	Acid fumes
Metal burnishing	Antimony, acid fumes
Metal etching	Arseniuretted hydrogen, nitrous fumes, mercury
Metal lacquer	Amyl acetate
Metal polishing	Oxalic acid
Metal refining	Nitrous gases
Meters, electric, manufacture of	Mercury, lead (see also Brass Industry)
Methyl amines	Dimethyl sulphate
Methyl esters	Dimethyl sulphate
Methyl ether	Dimethyl sulphate
Methyl violet	Anilin dyestuffs
Methylizing of every kind	Diazomethane
Mining	Arsenic, carbon dioxid, carbon monoxid, lead, mercury, nitroglycerin, nitrous fumes, sulphuretted hydrogen, and other gaseous products of combustion of explosive compounds
Mineral water, carbonated	Carbon dioxid
Mints	Nitrous gases
Mirbane oil	Nitrobenzol
Mirror plating	Mercury
Mirror silvering	Acetaldehyd, ammonia; lead, if backed with red lead
Moulds, drying	Carbon monoxid
Monotyping	Antimony, arsenic, acrolein, lead
Moulding, picture frame manufacture	Amyl acetate, bronze, methyl alcohol (see also Leaf Metal Workers)
Mordant in dyeing	Antimony, chromium compounds, etc.
Mosaic works	Manganese
Muriatic acid	Hydrochloric acid
Muslin green, color	Arsenic
Naphtha, naphthol nitrates	Benzin, benzol, nitrous gases
Naphthalein	Anilin, anilin dyestuffs
Navy	Carbon monoxid, gun firing, and furnace rooms
Nickel buffers and polishers	Lead, nickel-carbonyl
Nickel platers	Benzene, lime, nickel salts, petroleum
Neuwied green	Arsenic
Nitric acid manufacture, salts and storage	Nitrous gases
Nitrite of amyl	Amyl alcohol
Nitrificating in chemical works	Nitrous gases
Nitrobenzol	Anilin, nitrous gases
Nitrocellulose	Nitroglycerin, nitrous gases
Nitroglycerin	Nitrous gases
Nitrojute	Nitrous gases
Nitromannite	Nitrous gases

LIST OF INDUSTRIES IN WHICH POISONING MAY OCCUR
(*Continued*)

Branches of industry in which poisoning may occur	*Designation of industrial poison*
Nitronaphthalene	Nitrobenzol
Nitrophenol	Nitrobenzol
Nitrosaccharose	Nitrous gases
Nitroso dyes	Anilin dyestuffs
Nitrotuluol	Nitrobenzol
Oil, bleaching of	Chromium compounds, nitrous gases
Oil, solvent	Benzin, carbon disulphid
Oilcloth, manufacture of	Acrolein, amy lacetate, arsenical and lead pigments
Oil, vitreol	Sulphuric acid
Open fire heating	Carbon monoxid
Organ builders	Lead, bronze, methyl alcohol
Organic dyes, manufacture	Acridin, arsenic
Organic preparations, manufacture	Formaldehyd, phenylhydrazin, phosgene
Oxalic acid, manufacture of	Oxalic acid
Oxygen, manufacture of	Chlorid of lime
Painters and commercial artists	Arsenic, benzin, benzol, lead, mercury, methyl, alcohol, tar, turpentine, phenol, amyl acetate, carbon disulphid
Paper deoxidation	Nitrous gases
Paperhangers	Arsenic, lead
Paper mills	Chlorin, lead, sulphur dioxid, toxic color pigments
Paraffin refining	Carbon disulphid
Paris green	Arsenic
Parrot green	Arsenic
Paving material	Asphalt, tar
Pencils, colored	Anilin dyestuffs
Percussion caps	Mercury fulminate
Perfumes, manufacture of	Dimethyl sulphate, methyl alcohol, nitrobenzol
Petroleum industry, distillation and refining	Petroleum, sulphuric acid, hydrochloric acid, chlorid of lime, sulphur dioxid, lead, tar
Pharmaceutical preparations	Mercury, methyl alcohol, nitrobenzol, etc.
Phenol nitrates, manufacture of	Anilin dyestuffs, nitrous gases, phenol
Phenylhydrazin, manufacture of and its use for production of organic compounds	Phenylhydrazin
Phosgene, manufacture of and its use for production of organic compounds	Phosgene
Phosphor bronze	Phosphorus
Phosphorus extraction from phosphorites and coprolites	Phosphorus and hydrofluoric acid
Phosphorus, manufacture of	Benzol, phosphorus
Phosphorus, red, manufacture of	Phosphureted hydrogen
Phosphorus, sesquisulphid, manufacture of	Phosphureted hydrogen

LIST OF INDUSTRIES IN WHICH POISONING MAY OCCUR
(Continued)

Branches of industry in which poisoning may occur	*Designation of industrial poison*
Phosphorus and sulphur compounds	Sulphureted hydrogen
Photoengravers	Ammonium dichromate, nitrous fumes
Photogen factories	Phenol
Photographing establishments, material	Anilin colors, bromin compounds, cyanogen compounds, mercury, metol, chromium compounds, lead in retouching high lights.
Physical apparatus, manufacture of	Mercury, arseniureted hydrogen
Pianos, manufacture of	Bronze, lead, methyl alcohol
Picric acid manufacture	Anilin dyestuffs, nitrous gases, picric acid, phenol
Picture frames, manufacture of	Bronze, amyl acetate, methyl alcohol (see Leaf-metal Workers)
Plumbers	Arseniureted hydrogen, lead, carbon monoxid
Polish for furniture	Petroleum, methyl alcohol
Polish for metals	Oxalic acid
Porcelain enamelled ware	Lead
Potteries	Hydrofluoric acid, hydrochloric acid, lead, manganese, arsenic, chrome, carbon monoxid (see also Painters)
Printing establishments	Acrolein, antimony, benzin, lead, carbon monoxid, arsenic, methyl alcohol
Preservative fluid for animal tissues	Formaldehyd, methyl alcohol
Preservative for wood	Arsenical color pigments, phenol, tar
Projectiles, manufacture of, filling shops	Picric acid (see also Explosives)
Putty making	Lead
Putrefaction processes, gases of	Ammonia, carbon dioxid, sulphureted hydrogen
Pyridin, manufacture of	Pyridin
Pyrites	Arsenic, nitrous gases
Pyrotechniques	Antimony, arsenic, phosphorus
Quicksilver	Mercury
Rabbit fur for felt hats	Mercury, nitrous gases
Rag and shoddy industry	Acid fumes, infectious diseases
Rattan industry	Anilin stains, chlorin, chromium, hydrofluoric acid, methyl alcohol, sulphur dioxid
Red lead	Lead
Refrigeration plants	Ammonia
Rendering plants	Acrolein, benzin, carbon, disulphid
Resin, distillation of	Carbon monoxid
Resin, solvent for	Benzin
Rifle barrel, burnishing	Antimony
Röntgen tuber, manufacture of	Mercury
Roofers	Lead, solder, tar
Roofing paper, manufacture of	Tar

LIST OF INDUSTRIES IN WHICH POISONING MAY OCCUR
(*Continued*)

Branches of industry in which poisoning may occur	*Designation of industrial poison*
Roof tiling manufacture	Lead, carbon monoxid and other furnace gases
Rubber industry, including rubber toys	Anilin, antimony, arsenic, benzin, benzol, carbon disulphid, and tetrachlorid, lead, phenol, sulphur dioxid, and chlorid, tar, mercuric sulphid, methyl alcohol, turpentine
Rubber tires, assembling of	Carbon disulphid
Rugs, manufacture, dyeing	Arsenic and other toxic dyestuffs
Rust stains, removal of	Oxalic acid
Saffron yellow dye	Anilin dyestuffs
Salamanders, drying houses and plaster	Carbon monoxid
Sal ammoniac	Ammonia
Salts of mercury	Mercury
Sanitary ware factories	Lead
Schweinfurth green	Arsenic
Sealing wax, manufacture of	Turpentine
Sewer cleaning	Ammonia, carbon dioxid, sulphureted hydrogen
Sedimentation tanks	Carbon dioxid, sulphureted hydrogen
Sewing machine manufacture	Amyl acetate
Sheep dip manufacture	Arsenic
Sheele's green	Arsenic
Shellac, solvent for	Methyl alcohol
Shoddy manufacture	Hydrochloric acid, sulphuric acid
Shot manufacture	Antimony, arsenic, lead
Shoe manufacture	Benzin, methyl alcohol
Silk bleaching	Sulphur dioxid
Silk imitation factories	Carbon disulphid, ammonium sulphid, nitrous fumes
Silk weighting	Lead
Silver extraction	Mercury, cyanogen compounds
Silver metal	Arsenic, lead, antimony
Silver plating	Cyanogen compounds, mercury
Smelting furnaces	Carbon monoxide and other furnace gases
Smelting lead	Lead
Smelting mercury	Mercury
Smelting-sulphur bearing ores	Sulphur dioxid
Soap factories	Acrolein, nitrobenzol, sulphuric acid, pyridin, ammonia cyanid, sulphur, tar
Soda carbonate, manufacture of	Ammonia
Soda chlorid, manufacture of	Hydrochloric acid, chlorin
Soda sediment, manufacture of	Nitrous gases
Soda sulphate, manufacture of	Arseniureted hydrogen, hydrochloric acid
Soda sulphid, manufacture of	Sulphureted hydrogen
Soda works	Sulphureted hydrogen, hydrochloric and sulphuric acids

LIST OF INDUSTRIES IN WHICH POISONING MAY OCCUR

(*Continued*)

Branches of industry in which poisoning may occur	*Designation of industrial poison*
Soldering	Arseniureted hydrogen, carbon monoxid, hydrochloric acid, lead, nitrous fumes
Staining wood	Anilin, chromium, methyl alcohol, phenol
Stannic acetate	Hydrochloric acid
Starch, manufacture of	See Putrefaction Gases
Stamping designs on embroidery	Lead and rosin
Stamping mills	Mercury, nitrous gases
Stearic acid factories	Acrolein
Stearin refining	Carbon disulphid
Steel engraving	Mercury
Steel burnishing	Antimony, sulphuric acid
Stereotyping	Antimony, lead, carbon monoxid
Storage batteries	See batteries
Stone and marble polishers	Lead
Straw hats, bleaching	Sulphur dioxid
Straw deoxidation	Nitrous gases
Sugar, beet sugar	Ammonia
Sugar plants, saturation vessels	Carbon dioxid
Sugar refineries	Phosphorus, sulphureted hydrogen
Sulphur, refining of	Benzol
Sulphur metals, manufacture and use of	Sulphureted hydrogen
Sulphur extraction in gas purification	Carbon disulphid
Sulphur solvent for	Carbon disulphid, sulphur chlorid
Sulphur, water distillation of	Sulphureted hydrogen
Sulphur and phosphorus compounds, manufacture of	Sulphureted hydrogen
Sulphid colors, manufacture and use of	Sulphureted hydrogen
Sulphuric acid, manufacture of	Nitrous gases, sulphur dioxid
Sulphurous acid and salts, manufacture of	Nitrous gases, sulphur dioxid
Surgical dressings	Mercury, phenol
Swiss green	Arsenic
Tailors	See Garment Workers
Tallow rendering plants	Acrolein, sulphuric acid
Tallow refining	Carbon disulphid, chlorin, acid fumes
Tanneries, tanning and leather dressing	Ammonia, anthrax, arsenic, carbon dioxid (in tan pits), chromium compounds, lead (white leather), sulphur dioxid, sulphureted hydrogen, acids, benzin, amyl acetate
Tapestry printing	Turpentine, toxic color pigments
Tar color industry	Anilin, chromium compounds, phosphorus, etc.
Tar works	Tar
Taxidermy	Arsenic, carbon disulphid
Telephone wire, manufacture of	Lead

LIST OF INDUSTRIES IN WHICH POISONING MAY OCCUR
(Continued)

Branches of industry in which poisoning may occur	*Designation of industrial poison*
Tempering and hardening, steel magnets, piano wire, springs, files, etc.	Acrolein, cyanogen compounds, lead
Textile fabrics, deoxidation of	Nitrous gases
Textile industry	Arsenical colors, lead, sulphuric acid
Textile printing	Antimony, arsenic, chromium, lead compounds
Thermometers	Mercury
Thorium, preparation of	Nitrous gases
Tin foil	Lead
Tin ware and tin shops and tinning	Ammonia, arseniureted hydrogen, chlorin, carbon monoxid, hydrochloric acid, lead sulphuric acid
Tissue hardening and preserving	Formaldehyd
Toluol, manufacture of	Benzol
Toys, coloring of	Arsenic
Toy balloons, filling	Arseniureted hydrogen
Transfer chromos	Lead
Turkey red, mordant for	Chromium compounds
Typefounders	Acrolein, antimony, arsenic, lead
Typesetters	Benzin, lead
Ultramarine works	Sulphur dioxid, sulphureted hydrogen
Upholstery	Anthrax and infectious diseases
Valeric acid, manufacture of	Amyl alcohol
Varnish, manufacture and use of	Acrolein, ammonia, benzin, lead, methyl alcohol, turpentine
Vinegar, manufacture of	Acetaldehyd
Vienna green and red	Arsenic
Viscosin, manufacture of	Nitrous gases
Vulcanizing and red dyeing of rubber.	Antimony, arsenic, carbon disulphid (see also Rubber)
Wall-paper, manufacture of	Arsenic, lead (see also Paper Mills)
Wall-paper, hangers and scrapers	Arseniureted hydrogen
Waste waters of industrial plants making use of organic matter	Sulphureted hydrogen
Watch factories	Benzin, cyanogen, compounds, lead for dials, nitrous gases (see also Brass and Tempering)
Water gas, carburizing	Benzol
Water gilding	Mercury
Waterproof material	See Rubber
Wax bleaching	Chromium compounds, sulphur dioxid
Wax refining	Carbon disulphid
Weather vane gilding	Mercury
Well gas	Carbon dioxid
Whip, factories	See Rattan Industry
White lead	Lead
White metal	Antimony
Window shades, green	Arsenic
Wine cellars	Carbon dioxid

LIST OF INDUSTRIES IN WHICH POISONING MAY OCCUR

(*Continued*)

Branches of industry in which poisoning may occur	*Designation of industrial poison*
Wine preserving	Sulphur dioxid
Wire galvanizing with zinc	Ammonia arseniureted hydrogen, hydrochloric acid, sulphuric acid, zinc
Wire tempering	Lead, acrolein, cyanogen compounds
Wool bleaching	Sulphur dioxid
Woolen refuse, deoxidation of	Nitrous gases
Wood alcohol	Methyl alcohol
Wood deoxidation of	Nitrous gases
Wood impregnating and preserving	Arsenical paints, phenol, tar
Wood staining and polishing	Anilin colors, chromium compounds, lead, arsenic colors, methyl alcohol, alcohol denatured with pyridin, phenol, petroleum
Workrooms, crowded	Carbon dioxid
Yeast, compressed, factories	Carbon dioxid
Zyloidin, manufacture of	Nitrous gases
Zylol	Benzol
Zapone lacquer	Amyl acetate
Zinc chlorid, manufacture of	Arseniureted hydrogen
Zinc deoxidation of	Nitrous gases
Zinc ore smelting	Antimony, arsenic, carbon monoxid, lead, manganese, sulphur dioxid
Zinc plating	Ammonia, arseniureted hydrogen, hydrochloric, sulphuric acids and zinc
Zinc sulphate, manufacture of	Arseniureted hydrogen
Zoölogical preparations	Formaldehyd

CHAPTER XX

THE NATIONAL SAFETY COUNCIL

"Safety First" is the slogan adopted and made famous by a group of laymen who in 1912 met and formed the great National Safety Council. The work of this association has done more toward preventing accidents among industrial workers than any other single organization.

In 1914 a Health Section composed largely of industrial surgeons was incorporated as a part of this association. It was recognized that Industrial medicine and surgery must be a definite part of any successful scheme of accident prevention. The Safety engineer was responsible for the mechanical appliances attached to machines to protect the operator and for other physical conditions in the plant improving safety methods. The Safety Committee could spread the gospel of "Safety First" throughout the working force. But the doctor was the only one who could inspect the human machine and pick out defects in it which made accidents to the man or to his fellow men more liable to occur.

Therefore, with the induction of the industrial surgeon into the ranks of the National Safety Council a complete machine was formed for the prevention of accidents among industrial employees—the Safety Engineer for the correction of physical conditions in the plant, the Safety Committees to spread the educational propaganda among the workers, and the Industrial Surgeon, the Human Engineer, to correct the physical conditions in the employees.

Every industrial surgeon should be familiar with the founding and history of this National Safety Council. It has been the means of conserving thousands upon thousands of lives. It has stimulated the medical profession to greater efforts in prevention. "Safety First" is a twin brother of Preventive Surgery.

Mr. William H. Cameron, the Executive Secretary of the National Safety Council, a man who has devoted his life to this great humanitarian movement, has written the following history of this organization for the author to publish here.

> "And the end is that the workman shall live to enjoy the fruits of his labor; that his mother shall have the comfort of his arm in her age; that his wife

> shall not be untimely a widow; that his children shall have a father; and that cripples and helpless wrecks who were once strong men, shall no longer be a by-product of industry."
>
> JUHNKE.

"Accident prevention and health conservation are now firmly established among the institutions of free America. For a score of years individual efforts were made by progressive employers to meet the demands both of production and human conservation. Sporadic efforts sought to gather together the loose ends of the new industrialism, and to fashion an organization which would fit the needs of the twentieth century, but for lack of concentration and co-operation these efforts failed of lasting accomplishment.

"With the birth of the American factory system about the time of the civil war, came the doctrine of utility, and, for a time, grace and symmetry in product were sacrificed to unadorned simplicity. The cry was for speed, for production, for machine accomplishment and for 'tonnage,' and constantly increasing 'tonnage.'

"The old tradition of craftsmanship was swept aside and the workman became a mere part of the shop equipment. Short cuts to production were the order of the day and the so-called inherent 'risks of the trade' became the doctrine not only of the factory but of the legislative and judicial systems.

"But industry, never satisfied with established order, and seeking newer fields, turned from monotonous simplicity and taught the public a new lesson—comfort in living. Following closely in this development came lavishness and magnificence.

"Competition reached a keenness hitherto unknown. Vast capital was required and business management was alert to take advantage of the growing market. The world was scoured for raw materials for our workshops, with the brain centered on production, the drafting rooms became the lungs of industry, the sales force the nerves, the workshops the muscles and tendons. Every member of the industrial body except the heart was working at high tension.

"As was to be expected reaction set in. Progressive and thoughtful men began to weigh carefully the costs of operation and maintenance, and the utilization of by-products laid the foundations of fortunes that were not dreamed of under the law of 'tonnage' alone. Economics and efficiencies in operation, studies of costs and closer co-operation in manufacture logically followed.

"The Safety idea was born during the period of reconstruction of industry. It is a significant fact that the greatest of American

industries was the first to amalgamate all the forces of production and utility and business experience; was the first, as an organization, to publicly announce a crusade against industrial accidents and occupational disease. The Safety movement owes more to the United States Steel Corporation than to any other single business organization.

"The Association of Iron and Steel Electrical Engineers met in Milwaukee, Wisconsin, the week of September 30, 1912, and under the direction and enthusiasm of Mr. Lew R. Palmer, as Chairman of the Accident Prevention Committee of this Association, was launched the first National Safety Congress ever held in the United States. The resolutions announcing the birth of the new order of industrial justice are significant:

" 'Whereas, The Association of Iron and Steel Electrical Engineers, regarding as worthy of particular attention the hazards to life involved in electrical operations in steel mills, and appreciating the importance of the general Safety movement, not only in electrical engineering, but also in the steel industry as a whole, and in all the other varied and important industries of our country, and having met with such prompt co-operation in their proposals to establish a national organization devoted to securing increased Safety to human life, has reached the conclusion that such an organization can best be brought about by action at this joint meeting of the Association of Iron and Steel Electrical Engineers and the Co-operative Safety Congress; and it is, therefore, hereby

" 'Resolved, That the President of the Association of Iron and Steel Electrical Engineers be requested to take the first steps toward the formation of a national organization for the promotion of Safety to human life by appointing a Committee on Permanent Organization, which shall contain representatives of the Federal and State agencies already established to supervise conditions of Safety in our industries, and shall also contain representatives from the mining, transportation and manufacturing industries of the United States; and be it further

" 'Resolved, That the committee so appointed shall be and hereby is authorized by this Congress to organize and to create a permanent body devoted to the promotion of Safety to human life in the industries of the United States; this Committee to have authority to call future Congresses of Safety, increase its membership, if it so desires, and to do such other acts as will promote the object for which it is established.'

"The Congress met at the Hotel Pfister and among the delegates we find the following:

Dr. L. W. Chaney, Department of Commerce and labor.
Mr. C. L. Close, U. S. Steel Corporation.

Dr. Joseph A. Holmes, Director Bureau of Mines.
Mr. F. W. Houk, Commissioner of Labor, Minnesota.
Mr. John Kirby, Jr., National Association of Manufacturers.
Mr. James T. McCleary, Iron and Steel Institute.
Mr. Chas. C. McChord, Interstate Commerce Commission.
Dr. Chas. P. Neill, U. S. Commissioner of Labor.
Mr. L. R. Palmer, Association of Iron and Steel Electric Engrs.
Mr. C. W. Price, Wisconsin Industrial Commission.
Mr. R. C. Richards, Chicago and Northwestern Railway.
Dr. M. J. Shields, National Red Cross.
Mr. F. C. Schwedtman, National Association of Manufacturers.
Mr. David Van Schaack, Aetna Life Insurance Company.
Mr. H. M. Wilson, Bureau of Mines.
Mr. H. J. Young, Illinois Steel Company.

"Chairman Dr. Lucian W. Chaney, representing the United States Department of Commerce and Labor, opened the meeting as follows:

" 'I wish to impress upon those present that the effort in which we have entered in connection with this Congress is distinctly a phase of applied Christianity, and, therefore, it is exceedingly appropriate that we invite Dr. Steiner, Professor of Applied Christianity in Grinnel College, to offer a word of prayer as we begin.'

OPENING PRAYER

Dr. Edward A. Steiner,

Professor of Applied Christianity, Grinnel College

" 'Oh Lord, our God, who dost promise to those who meet in Thy name Thine own presence, we have come together not to consider our own weel or wealth; we have come here in Thine own name to consider the well-being of our fellowmen, and we would invoke Thy blessing, ask Thee to meet with us whom Thou hast chosen to be co-workers with Thee. We pray that Thou may be with us and help us not only to light the way, but help us to keep the way, and grant that everything that shall be done at this Congress shall work for the well-being of our fellowmen, for the glory and development of our own country, and for the speedy coming of the kingdom of God. May our consideration of the Safety of labor and the toiler be rewarded by a higher respect for humanity as a whole, a great regard for law, a purer and deeper and higher patriotism; wilst Thou bless this city in which we meet, this Commonwealth, our beloved country, the President of the United States, his Cabinet and all his officers; this great country and all its states from one end to the other, and may it continue to be

the great beacon to the world, lighting toward liberty and toward progress, and may the work which we do here this morning be a contribution toward that end. Bless the President of this association, all the officers, all those who take part, and may it be as solemn as it is sacred, and may it be as useful as we try to make it holy. We ask it all in the Master's name, who gave himself for the good of men. Amen.'

"Dr. Chaney's words were prophetic, Dr. Steiner's prayer has borne fruit. To-day Industrial Safety is firmly established as a part of our fabric of government. To-day the gospel of industrial righteousness is preached in thousands of workshops, and on the majority of the transportation systems.

"The modest meeting in 1912 developed into the National Council for Industrial Safety. Under the wise leadership of Mr. R. W. Campbell, President, and Mr. William H. Cameron, General Manager, and the effective co-operation of an earnest and enthusiastic staff, the Safety crusade took form and substance. The Second Safety Congress at the Hotel McAlpin, New York City, presented a program of activities which commanded the interest of all humane employers and effectively answered the critics of the movement. Two score of the biggest and broadest-minded men in the country accepted invitations to address the Congress, and their allegiance to the Safety movement firmly established the new crusade. About this time the slogan 'Safety First' became popular, welding all forces of the newest gospel into a concrete and effective organization.

"The National Council for Industrial Safety grew and prospered. The weekly Safety bulletin service was established and has been continued without a break for 175 weeks, and has grown to a distribution of 75,000 copies per week. Statistical researches were made and tabulated, and practical value given to shop activities never before dreamed of. The innovation of using available data in the simple and effective form of one page illustrated bulletins, rather than in the compilation of massive treatises, proved the value of the Council's services in teaching the lesson in readable form and fresh from the press. The Council doubled its membership and greatly increased its usefulness in this, the second year, of its life.

"Then came the Third Safety Congress, held at the Hotel LaSalle, Chicago. This series of meetings was epoch making, both in attendance and interest. The roster of speakers contained the names of Royal Meeker, Commissioner of Labor, U. S. Department of Labor; John Price Jackson, Commissioner of Labor and Industry, Pennsylvania; H. M. Wilson, Engineer in Charge, Bureau of Mines; Dean C. B. Connelly, Ida M. Tarbell, Alice Hamilton, Dr. Theodore Sachs, Dr. A. M. Harvey, Dr. Geo. W. Price, Martin J. Insull, William

P. Eno, E. A. Halsey, Fred C. Schwedtman and a host of others, all preaching and advocating industrial Safety and health conservation.

"It was at this Congress that the industrial medical practitioner first made his voice heard in unmistakable terms. Plant managers learned that the installation of adequate mechanical safeguards did not comprise their only duty. Sanitation, ventilation, control and eradication of industrial disease, elimination of communicable infections, all these and other questions were placed on the program and given a thorough discussion. Tuberculosis, blood poison, hernia, eye strain, and excessive fatigue were handled in a way to awaken the interest and co-operation of the large audiences.

"A year of intense activity followed. With the broadened scope of activities the association changed its name to 'National Safety Council.' The program of the Third Safety Congress furnished the text for the activities of the officers and members and the work was carried on with renewed enthusiasm. The membership doubled, and with every mail came scores of experience statements from plant officials to be compiled, digested, and reissued for the information of the whole membership.

"Mr. Arthur T. Morey honored the Council by accepting the office of chief executive for the third year, Mr. Campbell retiring as President at the end of the second year. It is significant of the interest taken in the work that the master minds of industry have cheerfully and unostentatiously given so liberally of their time and experience for the causes of safety and humanity.

"The Fourth Safety Congress was held at the Bellevue-Stratford Hotel, Philadelphia. To meet the demands of the Congress it was necessary to divide the Council into sections, each meeting larger in attendance and more ambitious in program than the first Congress at Milwaukee. The Governor of the Commonwealth, the Mayor of this City, the press, and the public united in a grand rally to further the propaganda of the Congress.

"After the great 'round table' gatherings, devoted to general discussion, ten sectional meetings considered the particular Safety problems of their industries. The Cement Section took a leading part in the Congress, as did the Mining, Steam Railroad, Laundry, Paper and Pulp Manufacturers, Public Utilities, Textile, Industrial Hygiene, Safeguarding of Machinery, Foundry and Woodworking Sections.

"It was at this gathering that the greatest truth in the Safety Crusade was forcibly driven home to the plant managers, the Safety Engineers, and the public, namely, that all the safeguards, all the rule books, all the discipline, and all other efforts must fail without the earnest and willing co-operation of the workmen themselves. Millions of dollars had been expended by the members of the National

Safety Council in perfecting the mechanical safeguards in their plants; other millions went for sanitation, for ventilation, for preventive measures, yet the men vitally affected too often showed only a perfunctory interest in their own welfare.

"A score of addresses and lectures were delivered at the Philadelphia Safety Congress pointing the way to success in administering Safety work—the way to the hearts of the millions of men and women toiling in the industries. The visiting nurse, the industrial physician, the dentist, and the teacher came forward and joined the social worker, priest and parson in the teaching of applied and practical Christianity. Industrial justice was heard in no uncertain terms.

"Another important lesson was taught out of the wealth of digested experience and statistical data furnished through the medium of the parent body—the National Safety Council. Where one accident was prevented through safeguarding three were prevented by the exercise of personal care and caution by the workmen themselves. Where one case of industrial disease was prevented in the shop or factory, two were susceptible of prevention and three of cure in the home life of the employees.

"From the date of the Fourth Safety Congress the importance of education, rather than compulsion in Safety matters, was given prominent place in the activities of the movement.

"The elasticity of the Council was never better exemplified than during the succeeding year. Employers who had held aloof, waiting for the movement to prove itself, came forward in whole-hearted recognition of the justness of the plea for a larger humanity. From an organization struggling to meet the patent demands made upon it in the simple necessities of everyday life, the Council almost in a day, was placed beyond the need of financial worries.

"From the Fourth to the Fifth Safety Congresses the membership again doubled in number; the work of the Sections was improved, an increased staff at headquarters facilitated the activities of the officers, and the newer phases of Safety work were pushed with unrelenting vigor. The record of the Fourth Congress is found in the 771 pages of the proceedings of the gathering—a living monument of service and a text-book on safety of incalculable value.

"The Fifth Safety Congress was held at the Hotel Statler, Detroit. Mr. Lew R. Palmer succeeded Mr. Morey as President, Mr. Morey continuing (as in the case of Former President Campbell) as a director and Executive Committeeman of the Council. The proceedings of the Fifth Safety Congress fill a volume of 1541 pages, every page a lesson and an inspiration.

"Perhaps the most important constitution for the cause of Safety by the National Safety Council, has been the organization and es-

tablishment of an Information Bureau and Library of every scrap of printed material available in the United States and foreign countries, relating to the work of the Council. This Information Bureau is at present in charge of two trained librarians who are classifying and filing this printed information, and sending it to the hundred of members inquiring for data every month. Every application for membership passes through this Bureau of Information, and the important bulletins and publications of the Council are sent to the new member to properly start him in his new activities. For the year ending April 1, 1917, four million bulletins were distributed to fifteen thousand representatives residing in every State of the Union, and in seven foreign countries.

"At the present time the monthly pamphlet called "Safe Practices" is in circulation, an encyclopedic work destined to take its place in literature with the foremost handbooks of the world. A modest number on 'Ladders' was followed by others on 'Stairs and Stairways;' 'Boiler Rooms;' 'Crane Construction and Safe Practices;' 'Knots, Slings, Bends and Hitches;' 'Belt Shifters,' etc. In time, it is intended to present every phase of industrial education and by rule, illustration and practice, complete a digest of Safe Practices for the prevention of accidents in the industries of America.

"In attempting a brief résumé of the work of the Council it is well to digress from its direct accomplishments to point, if only momentarily, to the reflection of its activities on other forces in society. Take from the shelf of any library devoted to law, medicine, public or private welfare any volume published in the last four or five years and run through the pages. You will find therein, whether in federal enactment, state law, or city ordinance, chapters, phases, and texts first enunciated at the Congresses of the National Safety Council.

"In this way is the history of the movement, and the monument to its founders and proponents, best perpetuated—in the lives and hearts of living men and women; in the healthy bodies and active minds of self-supporting and self-respecting workers, due, in many thousands of cases, to the whole-hearted co-operation of their employers in making this a better and a safer country."

CHAPTER XXI

ACCIDENT PREVENTION

Entire volumes have been written in recent years on the subject of accident prevention. In the last decade few topics connected with industry have received more attention or made more rapid progress. And yet the prevention of injuries to our workmen has not reached a high plane of efficiency, and in many concerns it is still more or less neglected.

In some nations the conservation of their people has caused high penalties to be placed against those employers who fail to prevent injuries from occurring to their employees. As a result, accident prevention has become standardized throughout their entire industrial field, resulting in great saving in life and limbs. In the United States the introduction of employees' compensation laws caused many concerns to adopt some system of accident prevention. But thus far these laws have not been drastic enough to place a penalty upon the concerns failing to take proper precautions.

In a few states, as for example Ohio, the accident insurance of all concerns is carried by the state government. The amount of premium paid by the employer is raised or lowered each year according to the number of compensable injuries which his employees sustained during the preceding year. This arrangement gave an impetus to the prevention of accidents among all industries in that state. While some concerns will voluntarily institute this form of prevention, yet it will not become universal until our nation makes it too expensive for any employer to allow preventable injuries to occur. It is imperative that every industrial surgeon should drive home this truth at every opportunity—*Prevention* is much *Cheaper* than paying *Compensation.*

Many laymen have entered this field of preventive surgery. Safety engineering has become a great specialty. Such an engineer is very essential as the prevention of many accidents depends upon building construction, mechanical appliances adapted to machinery, the rebuilding of some machines, and many other forms of mechanical work. But no surgeon should neglect to familiarize himself with every form of accident prevention.

It is impossible to cover the entire scope of this work in a volume devoted to so many other subjects related to Human Maintenance,

but the author would recommend the Transactions of the National Safety Council, and the book, "Accident Prevention and Relief" by Schwedtman and Emery, published by the National Association of Manufacturers, to every surgeon engaged in industrial practice. In this chapter, however, we will endeavor to show the relationship of the surgeon in industry to all accident prevention work, and point out the responsibilities which are his by many examples derived from actual experience.

Industrial accidents may be etiologically divided into three groups:

1. Those due to the physical conditions found in the working place.

2. Those due to certain physical or mental conditions found in the working force.

3. Those due to disaster, as fires, lightning, explosion, cyclone, etc.

The **prevention of accidents** must be done by:

1. Protection against potential accidents by safety appliances placed about the working place, or worn by the employees.

2. A study of the cause of an accident and protection against a recurrence.

3. Supervision of the physical and mental condition of all employees and correction of any causes for accident found in them; the removal of a susceptible employee to work where no hazard exists; the safeguarding of fellow employees from accidents liable to result from defective workmen.

4. Protection against disaster as far as possible and providing proper means of escape for the employees in case of disaster.

To accomplish the above **Accident Prevention** there must be:

1. Constant study and inspection of the physical conditions of the working place, by the safety engineer, the medical staff, the management and the employees, to discover causes for the potential accidents.

2. Careful study of the cause of each accident by the surgeon and safety engineer to ascertain whether mechanical conditions or conditions in the employee, or both, were responsible and how a like accident can be prevented in the future.

3. Educational campaigns on accident prevention by bulletins, lectures, motion pictures, by safety committees among employees, and by developing an atmosphere of *Prevention* throughout the entire working force (Fig. 39).

Before the "Safety First" movement started the greatest number of accidents were due to the physical conditions of the working place. This is still true in many concerns. But as protective appliances were installed, accidents from these causes decreased, and conditions found

in the employees themselves became more evident as a causative factor.

The commonest cause of injury was found in minor accidents, such as those due to splinters, pin pricks, nail wounds, scratches from loose wire, from tools, contusions as from hammer blows, tripping on loose boards, slipping and falling, etc. Even these minor accidents have been greatly reduced. But the greatest benefits have

Form H-3-R.

ACCIDENT PREVENTION POSTER

Number 11.

8 Men Killed—Each Death A Preventable Accident

1—Workman engaged in hauling load of cut wood. Load toppled over on him and he died of his injuries.

PILE ALL MATERIAL SAFELY.

5—Five workmen recently killed in different parts of State coming in contact with live wires.

PROPERLY PROTECT ALL ELECTRIC WIRES.

DO NOT TOUCH WIRES UNLESS YOU KNOW DANGEROUS CURRENT IS CUT OFF.

1—Workman burned with hot metal. Injury not reported and not properly dressed. Infection set in and he died.

REPORT ALL INJURIES AT ONCE AND RECEIVE PROPER MEDICAL ATTENTION.

1—Crane lifting planks. One plank slipped from load and hit workman on head, killing him.

KEEP FROM UNDER SUSPENDED LOADS.

8 Persons Unnecessarily Killed.

SORROW, SUFFERING, POSSIBLY WANT—ALL AVOIDED BY CAREFULNESS.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF LABOR AND INDUSTRY
JOHN PRICE JACKSON, Commissioner.

Fig. 39.—Actual facts make the best propaganda for prevention.

come from early treatment of these conditions thereby preventing any serious complications from arising.

The surgeon in charge of the "Human Maintenance" Department of an industry should be most keenly alive to the responsibility of accident prevention. It is one of the most important branches of preventive Surgery.

MAJOR ACCIDENTS

We will first take up the physical conditions in the working place, which may cause these accidents.

Every building connected with the plant should be thoroughly inspected to see that potential causes of accidents do not exist, or if found, that they are corrected.

The building should be strongly constructed so that it can stand the strain placed upon it. This is an engineer's or architect's job, you will say. This is true but wherever the least doubt exists the industrial surgeon should see that this expert advice is brought in to safeguard the employees. Every year severe injuries and deaths occur from the collapse of some building or scaffolding used in connection with industry. The surgeon thinking in terms of prevention should be the first to point out these dangers. He should know at all times if the buildings used by his concern, or any temporary structures which are erected, are safe.

Darkness is a Breeder of Accidents.—Every place in the building where employees must work or pass through should be adequately lighted. This is particularly true of all stairways or gangways.

All platforms or other elevations should be protected.

Unprotected Elevator Shafts are the Cause of Frequent Accidents.—Every known safety device should be placed on elevators. Too often we wait until an elevator accident occurs before taking proper precautions. Every gate to an elevator should be raised or lowered automatically when the elevator stops or before it can start.

Three garages were recently visited in a certain city, in which the elevator gates were not used at all. The elevator was run by any customer who came in and desired to go to the second or third floor for his car. This carelessness is bound to result in accident sooner or later.

Laws preventing such carelessness should be enacted and strictly enforced. The prevention surgeon should consider it his duty to report such conditions to the proper authorities. In other words, the prevention instinct in each should react not only for the good of the employees under us but for the good of mankind.

Temporary structures such as scaffoldings are notorious as a cause for accident due to collapse. One industrial surgeon persuaded the manager to rule that no temporary structure could be used until it had been thoroughly inspected by the safety engineer and pronounced perfectly safe by him.

The Failure to Keep the Building in Repair at All Times Is Often Cause for Accidents.—An employee reported to the doctor's office, in a certain concern, with all the flexor tendons of the wrist severed due to striking it against a broken window pane. Inquiry revealed the fact that this window pane had been broken for over six months.

In a busy concern, a heavy truck broke one of the boards in the floor. A week later an employee tripped on this broken board and fell

striking his head against the sharp corner of a box. He suffered a Pott's Fracture and a skull fracture. The repair of this defective floor would have prevented both. The sharp edge of the box left exposed so near the aisle was a potential cause for accident.

Every plant physician can recall many preventable cases which have resulted from broken conditions left unrepaired.

Loose Articles Left on Floors or on Shelves or Other Elevations are Dangerous.—Four employees were assigned the job of moving a heavy machine. When they had finished, one of them threw his crowbar down in the aisle. Another employee passing that way stumbled over the bar and fell forward into the pit where the machine had formerly stood. A broken humerus was the result.

Fig. 40.—Placards similar to this should be posted throughout the plant. (*Courtesy Conference Board Safety and Sanitation.*)

An employee engaged in opening a crate left the loose boards with nails in them, lying on the floor. A second employee stepped on one of the nails and developed a severe infection which resulted in three months' lost time from work (Fig 40).

After a building was completed, a loose brick was left on a cross beam over an aisle. One day, without any apparent cause, it dropped just as the foreman of that department was passing. It gave him a very severe scalp wound. The peculiar coincident about this, according to the foreman, was that "he had seen that brick there every day for months." If a keen prevention sense had been developed in the employees of this concern, no brick would have been left in such a dangerous position.

Protection of Employees from Falling Material.—The careless stacking of boxes, barrels, filled sacks, files of paper, of lumber, of pipes, and of other material, often results in the severest kind of accidents.

A new employee was assigned to stacking 200 lb. sacks of sugar in a warehouse. He piled them to the roof in a careless manner. Suddenly the sacks started to roll and an avalanche of them fell upon the employee, breaking his back.

The foreman was to blame in this case because he had failed to give proper instructions to his man.

Old or **broken machinery, broken tools, other appliances in similar condition** are frequent causes of accidents.

The explosion of old boilers became such a notorious cause of accidents that boiler inspection became a legal necessity.

Broken ladders have caused many a broken head or fractures in other bones.

In one concern a cracked emery wheel was left unrepaired for several months as it was not used frequently. One day while in operation it broke into a thousand pieces. One man was permanently blinded and two others lost time on account of injuries.

Thousands of examples could be collected of accidents resulting from unrepaired apparatus used by employees. Business men intent upon the larger problems connected with their plants often neglect these smaller leaks which uncorrected are a source of great financial loss to them. The plant physician is the logical person to point out these conditions.

In one industry hand infections were very frequent among the employees in the packing room. These usually resulted from minor injuries such as scratches, nail wounds, splinters, etc. Finally the surgeon made an investigation to ascertain the causes of these minor accidents. He found that nails were scattered on the floor and that boards with nails in them were lying about ready to cause nail wound. Goods were brought to the department in large baskets. Some of these baskets were old and the cause of many of the scratches and splinters was discovered in them. The bins where the goods for packing were dumped were lined with tin. In some of the bins this tin was loose and furnished a sharp edge where many small cuts could occur. Many other apparently trivial conditions were found as a cause for these minor accidents.

In making this inspection the men in the department were freely consulted as to how these scratches and splinter wounds were caused, and many valuable hints for correction of the same were thus obtained. The spirit of prevention was injected into the men by thus seeking their co-operation.

After the management was apprised of these conditions, steps were taken to prevent them. Every employee became a committee of one to keep nails off the floor and out of the way. A man was given the job of keeping all baskets in perfect repair, and the foreman was told to make a daily inspection of all bins and keep them repaired.

These precautions, combined with the immediate use of iodin when a minor injury occurred, practically did away with serious infections from this department.

This rather detailed report is given as one of the best examples of the work of the surgeon in accident prevention. It also points out the importance of keeping all physical conditions about the plant in repair.

Safety appliances on machinery have been the means of reducing major accidents to employees to a very marked extent. Most concerns engaged in heavy work such as the steel mills, electrical industries, railroads, and hundreds of others have safety engineers who devote their entire time to safeguarding machinery. The great number of machines that can be safeguarded and the variety of appliances make it impossible to go into detail about this form of prevention. The Safety First movement has made it familiar to all. The few illustrations given will elucidate to every student of the subject the importance of familiarizing himself with the specific appliances.

It is a human trait, however, to grow careless. "Familiarity breeds contempt" is too often exemplified by the old workman losing a limb on a dangerous machine with which he was so familiar that he neglected to use the safety appliance. A careful history of the accident taken by the surgeon will reveal this neglect. The doctor should report this to the safety engineer or whoever is responsible for making the men use the appliances. He can also use this history as a text for a bulletin pointing out to the fellow employees how John Doe lost his hand by neglecting to protect his saw with the safety frame.

In other words, the doctor is in the logical position to prevent carelessness on the part of the men or on the part of the management when there is a tendency to neglect this form of prevention.

It frequently happens that the safety device adopted by the safety engineer is not adapted to the machine and interferes with output. In such a case the men will often deliberately neglect to use it. Or, the safety device itself may be the direct cause of the accident.

As an example of this latter condition, I recall two serious accidents which occurred as the result of a safety tread which was placed upon a stairway. It was a stairway which led into a basement and was used chiefly by the women employees. No accidents had occurred here but the safety engineer thought he would anticipate trouble by covering the steps with a new type of safety tread. Shortly after it was installed a girl caught her heel upon the iron tread and fell down the

steps, fracturing her arm. The fact was reported to the safety engineer. His report, however, blamed the cause upon the high heeled shoes worn by the girl. The next day another girl fell down these steps, but no serious consequence resulted. A week later a third girl caught her heel in the same way, falling and injuring her leg.

It is needless to say that this "safety device" was removed, but only because the doctor followed up each history and was thus able to point out the cause.

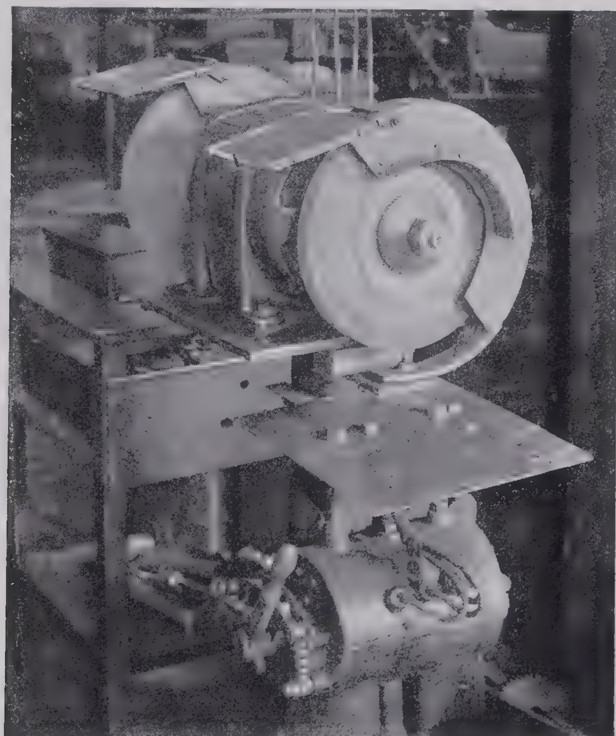

Fig. 41.—Properly guarded grinding wheel. (*Courtesy General Electric Co.*)

The high heeled shoe worn by an employee illustrates another cause of accidents—those due to faulty wearing apparel. The shoe with a loose sole often is the cause of falls. Or the worn sole will allow injuries from nails or splinters. A loose sleeve may get caught in machinery, pulling the arm in and causing a severe accident.

An employee was oiling a shaft five feet above the floor. He had a loose sleeve, and besides was doing the work while the shaft was in motion—a condition that should never be tolerated. The sleeve caught and the man was whirled around the shaft three times before the torn sleeve released him. His injuries caused fourteen months lost time and permanent disability.

A safety appliance attached to the employee is another means of prevention. The best example of this is the wearing of goggles in emery grinding or in any work where steel or other material may fly in the eyes. Here again the surgeon will find it necessary to constantly watch the employees to see that they observe this form of prevention.

Dr. Irving Clark of the Norton Grinding Works has some wonderful figures showing the almost complete eradication of eye injuries among their employees by not only supplying goggles to the men but by

Fig. 42.—Incorrect way of using goggles. (*Courtesy General Electric Co.*)

enforcing their use. Educational campaigns are the greatest means of securing the co-operation of the men in this form of prevention. Old emery grinders scorned this protection at first. Among these old timers were one or two men very adept at removing emery from the eye —"the eye doctors of the plant." Combined with the use of goggles it was necessary to teach the men to report at once to the doctor if any particles flew in the eye. The dangers of allowing a fellow employee to fool with the eye was impressed upon the men in a dozen different ways until at last this rule was observed by all.

One day in a box factory where old boards, occasionally with nails in them, were sawed up, an employee was struck in the eye by

a flying nail. His goggles were around his neck. He had neglected to use them because his foreman, an old timer, didn't insist upon his men using the "fool things." The loss of the eye resulted. The history of the case was posted throughout the plant by the surgeon as propaganda in favor of goggles. The next day a nail again flew from a board and struck the goggles being worn by the employee. The glass over one eye was cracked in a hundred places but the eye was saved. It was an act of Providence for the broken goggle was shown to every

Fig. 43.—Correct way of using goggles. (*Courtesy General Electric Co.*)

employee in that department and this, combined with the recent case of blindness, drove the lesson home. Even the foreman was converted but this didn't save his job (Fig. 44).

Whenever goggles are used the glass should be of the best material —that which will crack but will not fly into splinters. A number of such goggles are made.

Many other appliances worn by employees will prevent accidents. The study of each history of accident will enable the surgeon to suggest many such means of prevention.

We will next consider the second class of accidents: **those due to some physical or mental condition found in the employees.**

It is quite obvious, even to some hardened foremen, that if a man who is blind in one eye, or who has lost an arm, or who has some other gross handicap, is placed at certain occupations, he is liable to injure himself or to cause accidents to others. Or, if a man is mentally deficient, it isn't safe either for himself or for others, to allow him to run an engine. These are examples, however, of how certain physical or mental conditions in an employee can cause accidents.

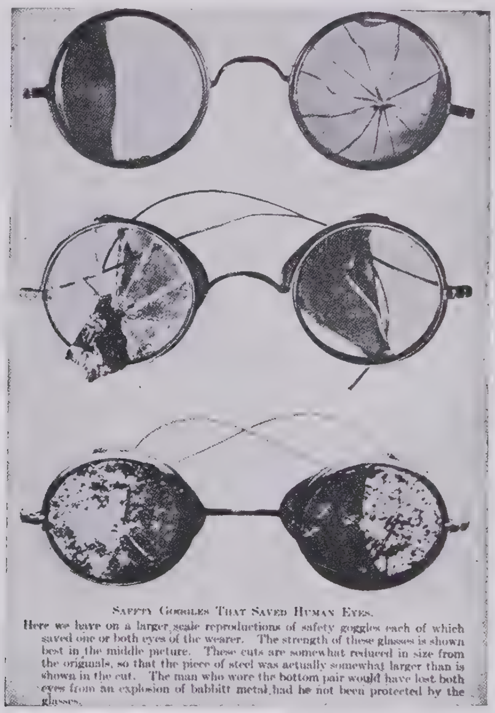

Fig. 44.—A poster which should be displayed wherever goggles for employees are required. (*Courtesy General Electric Co.*)

It is in this field that the surgeon dealing with accident prevention can render some of his most effective service to an industry. While these gross defects are evident as hazardous conditions, yet there are many other things which may exist in employees, making them "accident carriers," that only an experienced physician is able to discover.

Just as the frequent inspection of the physical conditions of the plant is necessary to prevent accidents, so is the frequent inspection of the employees essential to discover these physical and mental causes

for accidents. Here is one of the strongest reasons for the Supervision of Employees by medical examinations.

Every employee sustaining an accident, except perhaps the minor accidents where the cause is obvious, should be thoroughly examined to discover if any condition existing in him might be the active or predisposing cause.

When examining applicants for work, or when examining an old employee, the doctor should constantly be on the lookout for potential causes of accidents in the men. An employee with some physical handicap may be doing work dangerous for him, but the doctor can recommend his transfer to another occupation where he will be efficient and yet not be in danger of an injury.

For example, Mr. A, an apoplectic type, short, fat, and with flushed face, was examined. His heart was slightly enlarged and his blood-pressure was 200 mm. He felt perfectly well and was able to work. But his work consisted of sawing lumber on a large circular saw. The saw was protected yet if this man had fallen he might have been torn to pieces. This was a hazardous occupation because of his physical condition. A transfer was recommended by the doctor, and he was given the job of measuring and sorting lumber at the same wage. Two weeks later while at work he had a stroke of apoplexy.

An employee with epilepsy, or with a pathological condition liable to make him fall, as for instance apoplexy, heart disease, uremia, cerebrospinal syphilis, etc., should never be allowed to work about machinery, on elevations, or in other places where he could be seriously injured by falling. Such a man may be a potential cause of accidents to others.

The hit and miss method of placing men on jobs without a physical examination to ascertain their fitness for the work makes accidents from these causes much more frequent.

Epileptics are very hard to discover by examination. A history of attacks or actually seeing the attack are our only means of diagnosing this condition. Therefore, these cases often become accident hazards. Whenever an employee is suspected of or found to have epilepsy, the surgeon should carefully study his working conditions and recommend transfer to such work as will be safe. Many industries refuse to allow epileptics to remain in their employ because of this danger of falling and subsequent injury. The state care of epileptics with outdoor employment and proper attention to diet and other habits is one of the most needed social reforms of to-day. Many a sufferer from this disease could be reclaimed by a proper régime of work and care.

Mr. B, a new employee in a printing plant, had been examined for work and found O.K. A week later he fell in a fit of epilepsy,

striking his head against the printing press, and suffering a skull fracture. The loss to the concern amounted to several thousand dollars. Four people subject to epilepsy were employed in other departments of this plant. The concern cannot be censured because they immediately discharged these other men who were liable to fall and cause an equal loss. The state, however, can be blamed for not providing some place where these men could go for treatment and work.

Mr. C, a ten year employee in a certain plant, who had been periodically examined a number of times, reported to the doctor's office with a scalp wound. He stated that a box had fallen from a shelf and struck him on the head. There had been no witnesses. Two weeks later Mr. C reported again with a slight contusion on his cheek and a lacerated wound of the nose. This was due to a fall which resulted from tripping on a loose board, according to his statement. Again there had been no witnesses. Some weeks later this man again came to the doctor with another scalp wound. He claimed that he had fallen down stairs but no one had seen him fall.

This man was given an examination which was negative. An investigation in his department revealed the fact that an employee had seen him fall while in the wash room. When the man was confronted with this statement he confessed that he had fallen while standing in the wash room but didn't know what caused it.

The examination was then repeated and included all laboratory tests. These were again negative even to the Wassermann test on his blood. By this time the man had confessed to falling frequently due to "faints" and that his other injuries were due to these attacks. On account of this history a spinal puncture was made and the spinal fluid gave a strong Wassermann reaction. The man was suffering from cerebrospinal syphilis causing epileptiform attacks.

During one year the writer found three cases of cerebrospinal syphilis in the same industry. Two suffered injuries due to falling. The third had been diagnosed as lead poisoning by his family physician because the man was a painter. A thorough study of these cases will reveal the cause of the accident, and often of the occupational disease, to be due to the physical condition of the employee.

Dr. James Bordley reports a death and a serious accident in a steel mill from an overhead crane, both the result of defective vision in the operator of the crane. This man was given a thorough examination and his vision was found so defective that the man had no idea of perspective.

A man with serious heart disease was allowed to operate a dummy engine in a mine. His heart failure and sudden death resulted in injury to several employees who were in the cage being hoisted by this engine.

Innumerable cases of injury to the individual, or to others for whose safety the individual is responsible, could be related due to some condition in the employee, but these examples suffice to point out the lesson.

The third etiological group of industrial accidents are: **those due to disaster.**

Of all disasters **fire** causes more accidents than any other. Therefore, the prevention of fires is one of the most logical forms of preventive surgery with which the doctor can become associated. It is characteristic of our profession's shortsightedness that doctors as a rule have never considered it their duty to enter into a campaign for fire prevention. We have reduced disease by public sanitation but we have not put this same humanitarian effort into the prevention of accidents to the public.

Every industry has or should have its fire brigades, fire drills, rules for prevention of fire and means of escape for the employees in case of fire. It is one of the duties of the plant surgeon to point out these needs and to improve in every way these methods of prevention.

The National Safety Council has added a section on Fire Prevention to its organization. The transactions of this section, obtainable from this Association, are worth the study of all doctors and especially of industrial surgeons.

Specialized industries will have their special dangers for disaster. The surgeon must familiarize himself with these and make certain that proper precautions are taken at all times to safeguard the employees.

MINOR ACCIDENTS

The same preventive measures outlined for major accidents are applicable to many minor accidents. However, every surgeon connected with industry has found it most difficult to prevent a large majority of these minor injuries.

As a rule, a slight injury never causes any suffering to the employee nor any lost time from work with its corresponding loss of wages. Likewise, minor injuries occur so frequently to every worker that he becomes accustomed to them. These two facts make the prevention of minor accidents, and the prevention of complications when they do occur, very difficult.

An employee will get a splinter in his finger time and again. He removes it himself or gets some fellow employee to remove it. No trouble ever results. But the hundredth splinter results in a serious hand infection. It is often impossible to explain why all the other splinters were harmless and this particular one caused the trouble. For this reason it is hard to make the workman take proper precau-

tions with the ninety-nine splinters in order to prevent the hundredth one from starting an infection.

Nevertheless, the prevention of complications from these little daily injuries depends upon treating everyone *at once* as a potential trouble maker.

Examples of minor injuries that are almost impossible to prevent and yet frequently result in serious complications, are:

Dust, cinders, etc., flying in the eyes.

"Barking" the skin on tools, machines, boxes and other objects.

Hang nails, often due to the work.

Pin pricks—commonest in girls.

Wounds from splinters, nails and other penetrating objects.

Scratches or slight lacerations from nails, loose wire, loose boards, paper, and a thousand other objects with which the employee may come in contact.

Contusions from falling objects, striking the finger with a hammer, being bumped by a door, and other innumerable ways.

Slipping on the floor, tripping, and other unaccountable causes for falls.

From early childhood we have been receiving such injuries as these and only occasionally has some trouble followed. It is almost second nature to pay no attention to them. Therefore, it takes years of patient endeavor to educate a group of employees to take precautions when such unpreventable accidents occur.

These minor accidents must be combated by preventing complications from developing, as well as by teaching employees the "art of being careful."

In 1912 the author published the results of preventing infections among employees due to these mincr injuries. For the six months previous to January 15, 1909, the records of the doctor's office showed an average of twenty-six infections per month due to minor accidents. On that date every department was supplied with a bottle of tincture of iodin and another bottle containing applicators (cotton rolled on a toothpick). A letter instructing each employee to paint at once with iodin every wound received, which broke the skin, was sent to every man and woman in the plant. The managers were carefully instructed in the value of this procedure and kept a careful watch over the employees to see that they observed the rule. A daily inspection was made to see that the iodin bottles were filled and ready for use. Immediately these infections began to diminish. At the end of the year the records showed an average of eight such cases per month, a reduction of 28 per cent.

Many of these cases of infection which developed should have reported to the doctor but they thought the iodin treatment alone

made this unnecessary. Therefore, we had to add to our instructions *the immediate use of iodin and then the immediate reporting to the doctor's office no matter how slight the injury.* The importance of this preventive measure is further emphasized in the chapter on Hand Infections (Fig. 45).

Some industries may have used iodin previous to the publishing of this article but these were the first published statistics on the results. This procedure soon became quite universal in industrial surgery. Those who fail to get the best results fail to provide tinc-

Fig. 45.—Blood Poisoning.

John Doe of department 4 scratched his hand on a nail. He failed to paint the wound with iodin and to report to the doctor's office at once. He didn't think such a slight scratch would amount to anything. To-day John is in the hospital with blood poisoning.

On all injuries, no matter how slight, use iodin at once and report to the doctor at once. Example of educational bulletin posted in all departments.

ture of iodin in a convenient form and in a place easily accessible to all employees. To be 100 per cent. effective it must be used within two minutes after injury. Also to be 100 per cent. effective it should be followed, as soon as the employee can reach the doctor, with a protective dressing. It is impossible to say which of these is the most important but combined we have the ideal arrangement.

Some doctors have discarded iodin, which heretofore has proven our best friend, since the Carrel-Dakin treatment has received so much attention. As Dr. Lauffeur of the Westinghouse Company so forcibly pointed out—"iodin has proven its value and is the best preventive measure we have yet discovered for infections." This in no

way refutes the claims of the Carrel-Dakin solution as a treatment agency.

The protection of hands by gloves, of the eyes by goggles, of the legs and arms by asbestos covering when slight burns are liable to occur, and other protective methods can be adopted in many industries to reduce these slight accidents.

But the best method of preventing both major and minor accidents is by constantly instructing employees how to prevent accidents, how to prevent a recurrence of an accident, and how to prevent complications from developing when an accident has occurred. Combined with this there must be the most active treatment of every injury from the very moment it occurs until it is cured by a surgeon skilled in emergency surgery.

The **spirit of prevention** must be developed in the management, in the rank and file of the employees, and in the medical staff, in order to have an efficient human maintenance department.

CHAPTER XXII

THE SPIRIT OF PREVENTION

In this country accident prevention is still in its infancy. It started with a few laws requiring the safeguarding of a few certain well known hazards. Gradually a few industries began to safeguard machinery by safety appliances. This finally led to the Safety First movement inaugurated by the National Safety Council—a volunteer organization. Their work in the beginning consisted of the installation of every known device for preventing accidents. The American Museum of Safety, established several years ago, was among the first to do excellent work along this line by its exhibits of safety devices.

These and other safety movements starting with the mechanical prevention appliances all came to the same conclusion, namely, that while these are necessary yet the majority of accidents were due to the ignorance and carelessness of individuals. Therefore, to secure the greatest results, educational campaigns on Accident Prevention must be started and made universal.

In some countries such as Switzerland, Germany, and to a certain extent in England, accident prevention has long been a national problem. The governments have their official experts studying the problem from every angle. New laws increasing the safety of the working people are enacted almost every year. Inspectors to investigate and, mark you, to enforce the laws are in the field. And the money paid out in compensation makes both employer and employee more anxious to reduce the number of accidents. In addition, the school children are taught accident prevention and the colleges and universities give courses on this subject. Every means to engender a national spirit of prevention is used.

The "Stop, Look and Listen" sign at railroad crossings was the first educational propaganda for accident prevention ever introduced on a universal scale in this country. During the last decade the use of signs or bulletins as a means of spreading the gospel of prevention has become very popular. All kinds of signs are posted in trains, street cars, and in many industries, pointing out the means to avoid injuries.

In a few states the Departments of Industry and Labor, or the Industrial Boards, or the State Factory Inspector's Office have made the spread of this prevention propaganda one of their duties.

One of the best examples is furnished by the State of Pennsylvania Department of Industry and Labor under Commissioner John Price Jackson and his assistant, now acting Commissioner, Mr. Lew R. Palmer. They have formed a corps of experts on disease and accident prevention and the medical phase of the work is under the direction of Dr. Francis Patterson. While stimulating the use of every known safety appliance, yet they have found that the greatest results come

ACCIDENT PREVENTION POSTER
Number 17

EVERY

person who pays no attention to the

LITTLE

cut or scratch may think that there is no danger from such a little

BIT

of a wound. Accident reports show, however, that those are the ones from which blood poisoning usually develops.

FIRST AID TREATMENT

HELPS

to stop deaths from this cause.

DON'T FAIL TO HAVE MINOR INJURIES ATTENDED TO AT ONCE

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF LABOR AND INDUSTRY
JOHN PRICE JACKSON, Commissioner

Fig. 46.—Placards which spread the spirit of prevention.

from educational campaigns. Below are two examples of the placards which are freely circulated to every industry throughout the state, to be posted in conspicuous places for the education of their employees (Figs. 46 and 47).

Ohio, Massachusetts, New York, California, and a few other states to a lesser degree, have adopted this method of instructing workmen. It is applicable to the prevention of occupational diseases and many other diseases. It should be used more extensively.

In order to secure the co-operation of employers, workmen, safety engineers and plant physicians, Dr. Patterson organized, some two

years ago, the Pennsylvania Chapter of the American Association of Industrial Physicians and Surgeons, and invites, three times a year, representatives of all four of these groups to meet in joint session at the State Capitol to discuss both accident and disease prevention.

The American Association of Industrial Physicians and Surgeons are making efforts to persuade every state in the union to adopt a similar plan.

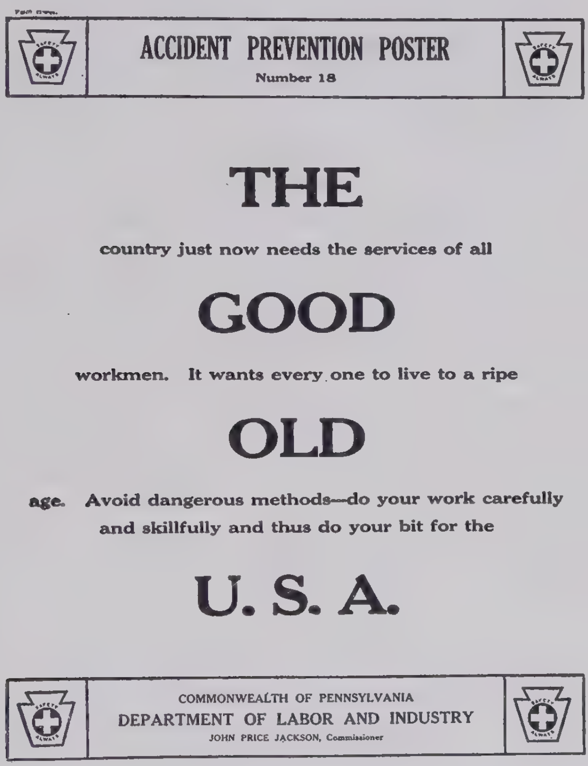

FIG. 47.—Placard which serves a double purpose—prevention, efficiency.

In some states the manufacturing associations have quarterly meetings to discuss these safety methods. As a result many employers have adopted the educational plans for prevention advocated by the National Safety Council.

In some cities the Associations of Commerce have rendered excellent service in teaching accident prevention. The Rochester, New York, Chamber of Commerce has been very active in both disease and accident prevention among the city's industries. Realizing that education must begin in the home they prepared a pamphlet and circulated it throughout the homes of the city. The following is quoted from this pamphlet:

"ACCIDENTS IN THE HOME"

"It is a peculiar thing that accident insurance companies find that the bath tub is responsible for the largest number of accidents that occur in the home.

"On first thought it seems extraordinary that this agent of cleanliness should have destructive features, but the number of people who slip in one way or another and fracture arms or legs or inflict minor injuries upon themselves in this way is surprising.

"Falling down stairs is the next most favored method of inflicting injury upon oneself. It is true that the stairways in homes are not so well lighted as those in office buildings, stores or factories, but it would seem that this lack of light ought to be more than balanced by the greater familiarity people would have with their own stairways.

"The high heeled shoe is responsible for many falls both in and out of the house, but it is especially dangerous on stairways where the edge of the heel catches and trips the wearer into a headlong fall.

"Burns, scalds and fires in the kitchen are responsible for much in the list of accidents. These occur either through carelessness or ignorance of conditions.

"The tea kettle, half full of boiling water, is taken to the sink to be filled, the top removed, the water turned on and the hand kept on the handle. The steam may cause her to drop the kettle, thus spilling the boiling water upon her.

"The grease employed in cooking some kinds of food is a source of danger because it both spatters and takes fire after being heated above a certain point. Burning grease is very dangerous and burns deep into the flesh and the wounds heal slowly. Should the grease take fire it is extremely difficult to extinguish the blaze.

"Persons who pull down shelves upon themselves, drop heavy weights upon their feet or inflict painful cuts by axes or hatchets, are in a class by themselves. The danger is specific in every respect and it is for the most part a thankless task to impress upon them general rules of carefulness; in other words, it is useless to suggest methods of doing things that should suggest themselves.

"It can be taken as a fact that accidents in the home are due to the fundamental causes, haste and carelessness.

"Will you, gentle reader, turn your attention upon yourself and upon these quotations? 'If the telephone or door bell rings, do you, in your haste to answer, endanger your life on the stairway or on rugs or waxed floor?' 'Do you mingle caution with your haste?' 'Do you, as you go through your daily routine, remember that it is just as important to do each thing carefully as it is to get the thing done?'

"If by neglecting precautions for your safety and the safety of others you increase the cost of living by breaking bones, straining

STANDARD SAFETY ORGANIZATION INSI

	CLASS A—plants having 1 to 50 EMPLOYEES shall have—	CLASS B—plants having 51 to 150 EMPLOYEES shall have—	CLASS C—plants having EMPLOYEES shall h

ORGANIZATION

CLASS A: A SUPERVISOR OF SAFETY WORK (employer, member of firm, manager, superintendent or foreman in charge) who shall:

1. Review and approve inspection reports and safety suggestions.

CLASS B and C: A GENERAL COMMITTEE of not less than three persons
Manager, Superintendent, Engineer, Master Mechanic, Fore

(1) Meet at least monthly and pass on all recommenda actions.
(2) Review and approve inspection reports.
(3) Familiarize themselves with the causes of all accide
(4) See that new employees are properly instructed as practices through the use of bulletins, printed rules
(5) Supervise the safety inspection and educational wc

CLASS C: A WORKMEN'S (changed at regular
(1) Make not recommen desirable. committee

INSPECTION

A SAFETY INSPECTOR, who shall be a competent person in charge of inspection service and shall:

(1) Make regular weekly inspection of the plant.
(2) Fill out and sign weekly reports showing conditions of the plant and recommendations for changes.
(3) Keep these reports on file in the office for review by general committee, state authorities and insu carriers. (Standard blanks are furnished by insurance carriers for this purpose.)
(4) Follow up general lines of outstanding safety work an
(5) Make or arrange for regular inspections of special equi each inspection.
(6) Look after fire conditions, extinguishers, filling of fire
(7) See that drawings and specifications for new equipmen conductors, etc.
(8) Inspect new machinery before placed in operation to see
(9) Investigate and report to general committee on all accid
(10) Inspect for m and lighting a

EDUCATION

A BULLETIN BOARD (or boards) suitably located on which safety bulletins (which shall be changed at least mo
Have on file a RECORD OF ALL ACCIDENTS by preserving dupli
QUARTERLY MEETII not be provided for these

The classification of plants operating more than one shift shall be determined by the largest shif
The following items indicate the effectiveness of existing organizations and should be a

(1) Written and signed records and reports.
(2) Consecutively numbered recommendations.
(3) Summaries of recommendations submitted, executed, and outstanding.
(4) Absence of rubbish and excess materials in and around plant and working places.
(7) Use of eye protectors by employees wh

Fig. 48.—(Courtesy of the National Manuf

ᑋECTION AND EDUCATION CHART

151 to 500 .ave—	CLASS D—plants having 501 to 1,000 EMPLOYEES shall have—	CLASS E—plants having over 1,000 EMPLOYEES shall have—

shall be selected from the following:
man or other employee in a position of authority and shall:
tions to determine their practicability and desirability, and keep records of meetings and

nts for the purpose of devising methods which shall tend to eliminate similar accidents.
to the hazard of their work and that employees of different departments are educated in safety
or oral instructions.
ɪrk.

:OMMITEE consisting of at least three workmen. The personnel of the committee shall be
intervals, preferably by rotation, and the committee shall:
less than one thorough inspection of the plant each month and shall submit written reports of
dations for installing, improving or maintaining safety guards or methods which they conside.
These reports shall be signed by members of the committee and submitted to the general
.

A FOREMAN'S COMMITTEE consisting of at least five foremen of different departments, the membership of the committee shall be changed at regular intervals, preferably by rotation, and the committee shall:

(1) Make at least one general inspection of the plant and hold at least one meeting every three months for the purpose of standardizing safety work throughout the plant.

A SAFETY ENGINEER who shall devote at least one-half of his entire time to safety and inspection work and who shall.

A SAFETY ENGINEER who shall devote his entire time to safety and inspection work and who shall:

(1) Make general inspections of the plant and equipment.
(2) Make recommendations for necessary safeguards, safe methods and safety precautions.
(3) Keep complete records required herein.

rance

.d keep records of same, which indicate progress.
ɔment, such as elevators, cranes, engine and motor stops, etc., and keep written records of

pails (water and sand) and keeping exits clear.
t cover the guarding of dangerous features such as gears, sprockets, couplings, high voltage,

: that necessary safeguards are provided.
ents.
ıaintenance of safeguards, general order and arrangement of materials and stock, cleanliness
.nd for obedience to shop rules.

ɪnthly) safety orders, rules and information shall be posted.
ıcates of reports on standard forms furnished by state department having jurisdiction.
IGS of employees at which talks on safety shall be given. Entertainment or other business may or may
: meetings.

SAFETY LITERATURE such as operating rules, warnings, notices, thrift propaganda, etc., which should be distributed to all employees in pamphlets, plant magazines, pay envelopes, or special bulletins and letters.

t or by the greatest number of employees regularly at work at any time.
vailable for exhibit at all times to properly authorized inspectors:

(5) Good sanitary conditions, illumination, and arrangement of tools and stock.
(6) Use of safe and sensible clothing and shoes by employees, with due consideration for hazards encountered.
:re necessary or desirable

acturers Association).

muscles, burning the flesh, to say nothing of the cost of replacing destroyed utensils and equipment, are you making yourself the best possible housekeeper?"

Recognizing that accident prevention depends upon Inspection and Education the National Association of Manufacturers has been very active in stimulating employers to adopt these two means of protecting the lives and limbs of their employees. They have prepared a plan for a standard safety organization which is now being

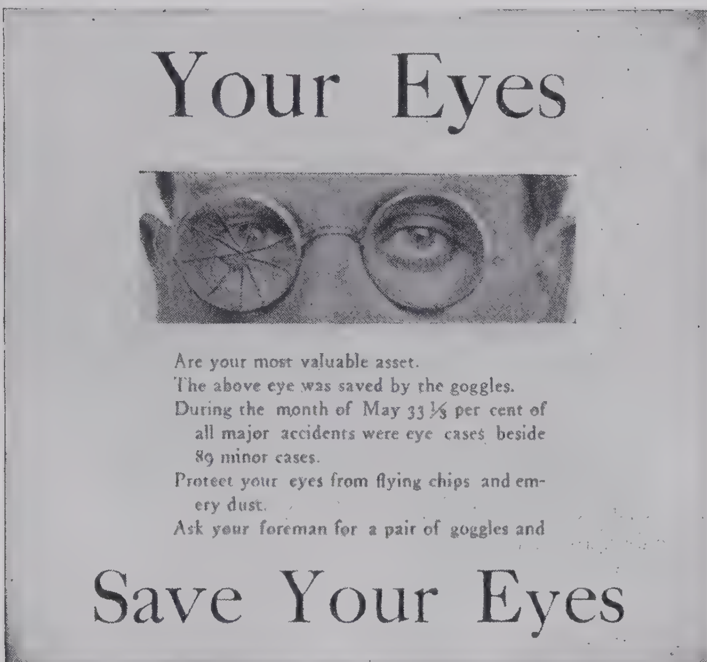

FIG. 49.—Example of anti-accident propaganda among the employees of the General Electric Co.

followed to a certain degree by many manufacturers. Those who enthusiastically endorse this plan have secured wonderful results because they have adopted it in toto. Others have only half-heartedly installed this system and therefore have not succeeded in reducing their accidents to as great an extent. In this work the results are in direct ratio to the thoroughness of the plan in force.

As surgeons should be the leaders in establishing this form of prevention in their industries this standard safety plan of the National Manufacturers' Association is set forth in detail (Fig. 48).

The fact that compensation underwriters make a 15 per cent. reduction in premiums in those industries where this standard safety organization is installed and rigidly enforced, indicates in a way the

monetary value of this form of prevention. It is impossible, however, to set forth in dollars and cents the great saving to employers, or the increased earning capacity from enlarged production which this or any other form of accident prevention means to a concern.

The National Manufacturers' Association, 30 Church Street, New York, has secured one thousand lantern slides illustrating safety first methods, as well as numerous motion picture reels, which it will furnish, free of charge, to those industries desiring to hold meetings for their employees on accident prevention work.

The National Safety Council, the American Museum of Safety, the United States Department of Labor, and many of the leading industries of the country are all very willing to supply material for educational campaigns on safety. Among those industries which have excellent material for instruction purposes are the United States Steel Corporation, the General Electric Company, the International Harvester Company, the Brooklyn Rapid Transit Company, and others.

The Conference Board on Safety and Sanitation, of which Mr. Magnus W. Alexander of West Lynn, Mass., is Executive Secretary, publishes a monthly periodical called "The Spirit of Caution" which is of the greatest value to surgeons and others interested in spreading accident prevention material.

Mr. R. J. Young of the American Museum of Safety has set forth the relative value of the various forms of safety work employed by the Illinois Steel Corporation during a period of ten years. He has divided their safety work into three branches and estimates the value of each as follows:

I. Organization	45 per cent.
(*a*) Attitude of officers	20 per cent.
(*b*) Safety committees	20 per cent.
(*c*) Inspection work	5 per cent.
II. Education	30 per cent.
(*a*) Instruction of men	15 per cent.
(*b*) Prizes	9 per cent.
(*c*) Posting of signs	3 per cent.
(*d*) Lectures, motion pictures, etc	3 per cent.
III. Safeguarding	25 per cent.
(*a*) Guards	17 per cent.
(*b*) Lighting	5 per cent.
(*c*) Cleanliness	3 per cent

Since organizing the safety committees and securing the proper attitude of the officers toward the work is largely educational, it is

quite apparent that at least 70 per cent. of the success in safeguarding employees against accident is the result of well organized educational campaigns against these accidents.

It is quite evident that unless the officers of an industry become personally interested in accident prevention progress in the work will be very slow. Those concerns which are the farthest advanced in the safety movement and whose employees have acquired the spirit of prevention to the highest degrees are the ones in which the president or other executive members of the industry have taken an active part in the work. They have become associated with the National Safety Council and other such organizations. They attend the meetings in person and by the giving and taking of suggestions they become thoroughly imbued with the ideals of "Safety First." Such men keep in advance of their medical staffs and safety engineers rather than half heartedly following the advice and suggestions of them.

Of equal importance to securing the co-operation of the employers in such work is to secure the whole-hearted co-operation of the employees.

The organization of safety committees among the employees has been a most potent means of spreading prevention propaganda. These committees should be changed every year so that a few new members are added, thus increasing the number of prevention experts throughout the force. Such committees receive suggestions from the employees as to means of bettering safety arrangements; they are constantly on the lookout for potential accidents; they are themselves the seeds of prevention from which the great spirit of prevention must grow.

Qualified inspectors of safety methods are essential in every large plant where accidents are prone to occur. These inspectors can be of the greatest value to a concern if their vision is broadened to the extent that they think in terms of prevention from every angle rather than from the standpoint of safety appliances alone. Thus, the inspector who is ever on the lookout for unsanitary conditions in the working place, or for unhealthy appearing employees, and has the vision of preventing accidents, the result of any cause in the working place or among the workmen themselves, is invaluable to his concern. Such an inspector will welcome suggestions from the medical staff and will work in the closest co-operation with the doctor. If the safety experts could better realize this, the value of Mr. Young's inspectors would be 25 per cent. instead of 5 per cent. as shown in his table.

Most of the educational methods have been described. However, the use of "prizes" is mentioned in the above outline. These prizes refer to the method of giving a bonus, or a prize, to that department having the lowest accident rate—a plan adopted by several concerns.

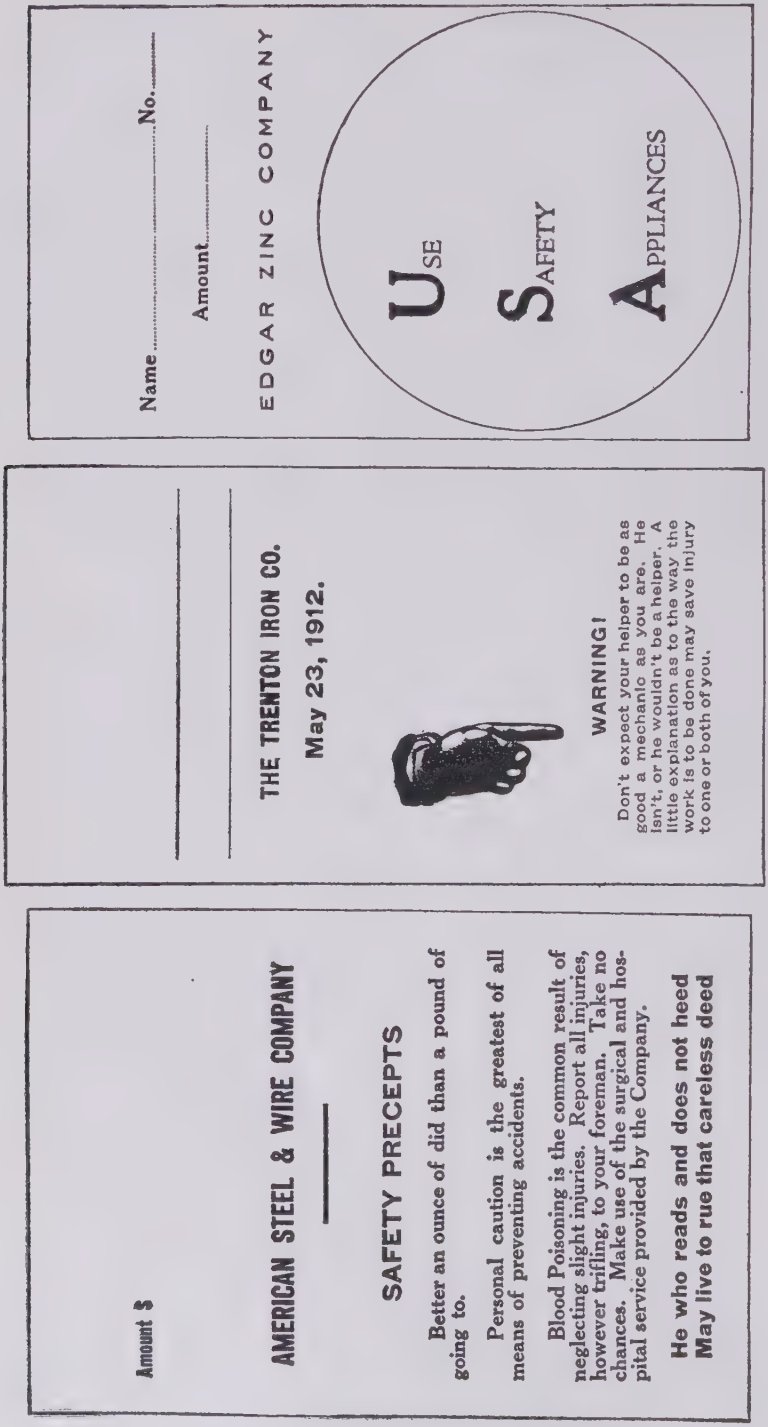

FIG. 50.—Examples of prevention propaganda printed on pay envelopes.

This has been a successful means of reducing accidents and has been a great incentive to the men to be careful. The careless employee who makes his fellow employees lose their bonus because of his carelessness doesn't usually repeat the experiment.

One of the best means of educating the employees in safety precautions is by short, terse statements or warnings printed on the pay envelope. These envelopes are usually carried home, thus extending the scope of their lessons to the family as well. Many concerns have employed this method for disease as well as for accident prevention. They have developed their own forms of advice and have ex-

Fig. 51.—Safety precepts taught by illuminated sign at works entrance. (*Courtesy U. S. Steel Corporation.*)

changed with other concerns until almost every angle of prevention has been covered. The three pay envelopes herewith reproduced illustrate this method (Fig. 50).

The United States Steel Corporation has large illuminated signs over every gate leading into their plant. Every week some new safety advice is there for the men to read as they go to their work. This constant educational work is one of the best examples of an industry developing the spirit of prevention among its employees. The following list of wordings used on pay envelopes and illuminated gate signs was furnished by the management of the United States Steel Corporation and is reproduced here for the benefit it may be to others:

1. The prevention of accidents and injuries, by all possible means, is a personal duty which everyone owes, not to himself alone, but also to his fellow workmen.

2. Do not get into dangerous places until you are absolutely sure they are safeguarded; also prevent anyone from going until this is shown to be a fact.

3. Remember it is better to cause a delay than an accident.

4. Small neglects are apt to cause serious accidents.

5. Let every employee make himself a committee of one, to prevent some *one* accident.

6. The failure to obey safety rules endangers the life of yourself or fellow workman.

SAFETY

7. It pays to think before you act.

8. One man's effort toward safety may seem small, but altogether can do a great deal.

9. Every effort in this direction helps.

10. Be sure everything is safe; then go ahead.

11. Help to prevent accidents.

12. Look out for the other man, you might hurt him.

13. Try to avoid accidents;
this means
YOU

14. Do not work with unsafe tools. Tell your foreman.

15. Every injury, no matter how slight, should receive medical attention.

16. Never remove or even touch a safety flag, tag or target. Always get the man who placed it to remove same.

17. Safety committees may overlook something. See for yourself that all is safe.

18. Do not fail to notice all danger signs, and if possible, see that no one disregards them.

19. Safety devices are of little value unless maintained and used as they are intended.

20. Careful men are usually efficient; careless men are not.

21. Use safety devices where provided. Don't take a chance.

22. Replace all guards and safety devices when through making repairs, and before machinery is started.

23. It is your duty to report unsafe conditions to your foreman or superintendent.

24. Every sign in the mill means that the danger pointed out is there. You must obey these warnings.

25. Don't fool with electricity. It is dangerous.

26. Look out for loads carried by overhead cranes and do not stand under them.

27. Employees are cautioned to look out for torn clothing as same is liable to be caught in machinery.

28. Foremen: Carelessness is dangerous. If workmen insist on being careless, discharge them.

29. The proper inspection of tools and machinery by employees using same will help to prevent accidents.

30. The more you insist upon carefulness on the part of others, as well as exercising it yourself, the safer it will be for all.

31. Be careful in doing your work to avoid accidents to yourself and fellow workmen.

32. Warn a man when danger is near. He may know all about it; if so, no harm is done. If not, you may save him from injury.

33. To be careless, thoughtless or reckless means injury sooner or later to yourself or others.

34. Employees are forbidden to take short cuts over dangerous places.

35. Every employee, whose duty requires him to work with appliances of any kind must carefully examine same and report any defects.

36. We will welcome suggestions from employees on anything of a dangerous nature.

37. Keep off railway or crane tracks, except the regular crossings. Before crossing any tracks: *Stop! Look! Listen!*

38. To avoid accidents to yourself and others, in case of doubt take the safe course.

39. Always be careful and take no risks.

40. The exercise of care to prevent accidents, is a duty which you owe to yourself and your fellow workmen.

41. You are responsible for the safety of others as well as of yourself.

42. Beware of blood poisoning. A wire scratch will cause it sometimes.

43. It is your personal duty to see that all safeguards and signs installed to promote safety are always in good condition, and report all dangers promptly to your foreman or superintendent. The prevention of accidents is one of your most important duties.

44. Safety must be the first consideration of all employees. In all cases of doubt take the safe course. When in doubt as to the matter of a rule, or sufficiency of a proposed precaution, take the matter up at once with your foreman or superintendent.

45. Rules and regulations can be adopted, safety devices can be attached to machines, guards can be erected and warning signs posted, but all are useless unless every man is careful to see that they are maintained; unless every man is careful to watch for danger; unless every man is careful to warn others of danger.

46. Never attempt to make a coupling or work between cars on the short side of a curve.

47. It is as much your duty to comply with safety rules as it is your duty to properly perform your work and it is the desire that you be thoroughly impressed with this idea.

48. Don't swing sledge or hammer that you know is working loose on handle, thinking it won't come off till "next time." You may not be hurt but what about the other fellow?

49. Don't expect your helper to be as good a mechanic as you are. He isn't or he wouldn't be a helper. A little explanation as to the way the work is to be done may save injury to one or both of you.

50. At quitting time do not hurry over railroad tracks or through dangerous places. Be on the lookout and take sufficient time to be sure there is no danger ahead. Serious accidents have been the result of not taking this precaution.

51. Indifference to the safety of others may in the course of events sometime place your own life, or that of a member of your family, in danger.

52. A guard is placed on a machine solely for your protection. Don't operate a machine without a guard in place.

53. Stop machine before oiling, wiping or repairing it, and don't try to operate a machine you do not understand.

54. It takes less time to explain why you were late than to make out an accident report.

55. Be sure to warn teamsters and others working in or about cars before coupling to moving cars. Men who are working in cars often want to remain inside while cars are moving. Don't allow this.

56. When you find a highway alarm bell out of order, ticklers in bad condition, or anything that needs prompt attention to prevent accidents, make a report of it to the proper person. You may save someone's life.

57. Don't go between moving cars or engine and car for any purpose whatever. The usual reason for going between moving cars is to turn the angle cock or life pin when the lever does not work. Wait until cars stop. The few seconds' time required is a good investment. Many persons are injured and killed every year by failure to heed this caution.

58. Never try to shift a moving belt by hand.

59. If you know of some machine not properly guarded, don't wait until someone gets hurt and say, "I told you so." Tell the man in charge of the shop before an accident happens, and ask him to supply proper guard.

60. Avoid jumping upon moving cars or engines. Your work does not require it and you cannot afford to take the risk.

61. Never strike tempered steel with hammer or other metal object. Many eyes are injured or destroyed from this cause every year.

62. Watch out for trains. Don't depend on the other fellow.

63. Keep frogs, switches and guard rails properly blocked. This is very important.

64. See that material is kept a safe distance from track, where men on side of cars will not be struck by it.

65. Always bend nails down before throwing boards away. Many serious injuries result from stepping on protruding nails.

66. Look in both directions before stepping on any track, especially in yards. Be particularly careful when crossing track near cars or engines and when about to step from the track containing same upon another nearby track.

67. Cultivate a habit of caution—carelessness often leads to loss of life.

The medical profession can claim great credit for developing many forms of prevention. The public health departments by safeguarding the milk and water supply, by stimulating proper sewage disposal, by all forms of sanitation and quarantine, have been the means of saving millions of lives from disease. Medical scientists have devoted their time to the study of the causes of certain diseases and thereby made possible the prevention of the same. But our profession has been very lax in their efforts to prevent accidents. Industrial accidents, claiming a greater toll of life than many of these diseases, have been ignored by the majority of physicians. The great preventive surgery movement has been left to the laymen to develop. Even to-day our best surgeons receive injury cases into the hospital, operate and otherwise repair them and finally discharge these patients without giving one thought as to means of preventing a similar accident to other men.

A surgeon once said, "That factory is a little gold mine for me. I get on the average of two fractures and six hand infections a week from among their employees."

When asked if he had ever inspected the factory to see why these accidents were so prevalent, he replied that that wasn't his business. This same doctor had been the most active advocate of cleaning up the city, providing proper sewage disposal, and otherwise reducing the amount of typhoid in his home town. He wasn't mercenary. His vision of prevention had simply not broadened beyond the horizon of disease prevention. If he had received into the hospital six cases of typhoid a week, he would have moved heaven and earth to discover the cause of the epidemic and would have been very active in securing the removal of the public health officials responsible for such a condition.

It is quite evident that our educational propaganda against accidents must extend to the medical profession. Municipal health departments must develop a division of safety as well as one of sanitation. Health officials, municipal and state officers, and factory inspectors must co-operate to secure prevention of accidents in every community. This must become a public fight against a nuisance that heretofore has been tolerated. For over a year I have fruitlessly tried to have "safety," as is sanitation, included as a part of the work of the medical department of the Army.

Yet all of the profession cannot be accused of a lack of vision with regard to this form of prevention. Years before the safety first movement, started by laymen, developed, a few surgeons connected with industry began to point out the need of preventing accidents and the need of preventing serious complications when accidents did occur. When the National Safety Council was organized these doctors pointed out the need of co-operating with the surgeon in industry in order to secure the best results This was the basis of forming the Health Service Section of the National Safety Council, which deals with accident prevention methods from the physician's standpoint.

At about the same time the American Public Health Association formed a section on Industrial Hygiene which deals with occupational disease prevention and many other prevention measures including accident.

Both of these National Associations have started movements for disease and accident prevention which are directly for the benefit of the people of the Nation. They have raised money and are carrying out many functions that should be recognized by and have the active backing of the National Government. In fact this voluntary machinery should be taken over by the Government. Both should be combined under a Federal Health Administration which would make possible the greatest advancement in accident and disease prevention throughout the nation. The surgeon in industry has become the stanchest advocate of a federalized health and safety department. The two must be combined.

Just as the doctor is finding it necessary to co-operate with and use the services of the social worker, so he will find it necessary to co-operate with and use the services of the safety expert. The problem as a whole involves the field of preventive medicine and preventive surgery and belongs therefore primarily to the medical profession. When will they see the light and grasp their opportunity?

In all the literature on accident prevention you will find the problem is handled from the laymen's point of view almost entirely. The outline of the various values of each procedure, as set forth by Mr. Young and quoted in this chapter, assigns the best means of

prevention to organization, education and safeguarding. He has ignored the most effective agent for accident prevention in any industry, namely, the surgeon who is on the job.

This is not the fault of Mr. Young or of other safety experts. It is the fault of the surgeon in industry who has neglected to seize the opportunity of becoming the leader in the accident prevention work. The surgeon in charge of the human maintenance department of an industry should feel most keenly the stigma attached to every preventable accident occurring in that industry. Just as he bends every effort to secure the best result in reclaiming an injured employee so should he strive to conserve the employees by every preventive method.

It is the duty of every plant surgeon therefore to make the following methods a definite part of his duties:

1. Secure the active co-operation of the executives of your concern in accident prevention, by pointing out needed changes, by reporting every accident and how it could have been prevented, to the chief executive, and by enthusiastically telling them of steps taken to safeguard against recurrences. Make your reports and suggestions in writing, short and to the point.

2. Instruct the employees individually and in groups in safety methods. Use every injury as a text for instructing that employee in prevention while furnishing him surgical attention. Every preventable accident should be posted on the bulletin boards throughout the plant, thus:

John Doe, of Department 15, is in the hospital with a skull fracture. One of his fellow employees carelessly shoved a crate from the top of a pile of boxes to the aisle below without looking to see if anyone was walking in the aisle. The crate fell on John's head causing a bad scalp wound and fracture of skull. *Always look before letting anything fall and avoid injuring others.*

Or, in case of a minor accident that later becomes infected, post a bulletin similar to the one shown in the illustration. The picture of the infected hand and the warning to use iodin at once and to report to the doctor at once makes an indelible impression upon most employees (Fig. 45).

3. Make frequent inspections of the plant, first to pick out possible accident causes, and second to pick out the employee who because of his general appearance, his methods of working, or his mental attitude, might be a potential cause for accidents to himself or to his fellows. The surgeon, drawing on his experience of dealing with accidents, can be invaluable in spotting these possible causes.

4. Assist in the formation of safety committees, meet with them, and thoroughly instruct them in every angle of accident prevention—

especially call their attention to the types of employees who can cause accidents. Make them inspectors of both the mechanical appliances and the human machine.

5. Secure a careful history of every accident and follow it up to see that the proper precautions are taken to prevent a recurrence.

6. When inspecting an employee either at work or when he reports to the office for any cause observe whether his clothing such as improper shoes, loose sleeves, etc., might be the potential cause of accidents.

7. Examine every injury case to ascertain if the cause for the same lies in the physical or mental condition of the employee himself.

8. Use physical selection of employees for work so that the predisposed cases will not be placed in hazardous positions. This applies to both applicants for work and old employees.

9. Use every educational method which will drive home the lessons of safety and will cause each employee to be alert to prevent accidents to himself or others.

10. *Eat, sleep and breathe Prevention.*

With the growth of industrial medicine and surgery these preventive methods are extending to all branches of industry and to the community life of every industrial center. Preventive surgery has been born. The fathers of this branch of medicine are rendering a service to humanity equal to that of the leaders in preventive medicine. The field has just been touched, however. Before us lies the opportunity of spreading these principles to the entire nation.

CHAPTER XXIII

THE INFLUENCE OF NEW EMPLOYEES AND "SPEEDING-UP" ON ACCIDENT RATE

Many industries in this country were forced to take on great numbers of new employees and to "speed-up" production on account of the great demand made upon them by war conditions. Since our nation entered the world war this "speeding-up" process has been especially pronounced. Such a condition invariably results in an increase in the number of accidents, no matter how thorough is the system of prevention which has been developed.

Under average conditions the taking on of new employees simply means extending to them at once every facility to become acquainted with the accident prevention methods. They are taught the use of the safety appliances; instructed in preventive measures such as the use of tincture of iodin, and the reporting to the doctor at once when injured; they receive more personal attention from everybody.

But when there is a universal speeding-up of most industries several conditions conspire to frustrate these established methods. The labor market is so scarce that concerns feel forced to be more lax in the choosing of employees. The ease of securing work causes a larger floating labor population. Men jump from job to job seeking higher wages and other inducements. The short time on the job tends to unfamiliarity with the prevention rules. The medical staff is unable to examine these applicants as thoroughly as formerly, and men are assigned to jobs for which they are physically unfit. *The green hand in an unfamiliar occupation is always more prone to injury.*

Every surgeon connected with an industry has witnessed the great increase in both accidents and sickness among new employees, especially the "floaters," when speeding-up of production has occurred. In an industry where every possible safeguard was used, the working force was suddenly increased and every department was speeded-up. The following statistics illustrate the resulting accident disability increase:

Table 8

	Jan. 1 to Sept. 30			Oct. 1 to Dec. 31		
	1915	1916	Per cent. relative increase or decrease	1915	1916	Per cent. relative increase or decrease
Average employees per month	10,649	12,485	+17.0	11,937	15,238	+27.6
Number of plant accidents	4,628	5,213	− 3.6	2,203	2,712	− 3.6
Per cent. injured	4.83	4.64	− 3.8	6.16	5.92	− 3.9
Accidents causing time loss	343	640	+32.6	185	411	+74.2
Total number of days lost	3,439	3,411	−15.1	1,622	2,915	+41.8
Accidents causing more than seven days' loss	117	123	−10.0	45	104	+61.6
Days lost from above	2,784	2,005	−38.4	1,250	2,279	+43.0
Number of infections	409	469	− 2.1	157	241	+20.3
Days lost from above	566	450	−32.0	241	366	+19.2

It is only after a few years of experience and after keeping careful records for comparison that the surgeon in charge of the Human Maintenance Department comes to realize that these new employees, often the transients, are the greatest factor in a high accident rate.

The author once exhibited great pride in his low infection rate, the result of injuries. For weeks there had been no hand infections of any moment in spite of the slight, practically non-preventable, minor injuries. Then at the Christmas rush many new employees were taken on. In one week three very serious hand infections developed which caused great loss of time and much expense. Two histories will illustrate the point in mind.

Miss B., employed on November 30, stuck her palm, right hand, on a spindle. She thought it was not serious and so did not mention the fact. She knew nothing of the rules about painting every injury with iodin and reporting to the doctor at once. Two nights later the hand became very swollen and painful. Instead of calling the plant surgeon (she said she didn't know that she could call him), Miss B. went to a doctor near her house, who made a slight incision in the palm and put on a dressing. Two days later the nurse called when this girl was reported home on account of sickness. The plant surgeon after three days took charge of the case and had to deal with a serious middle palmar abscess which caused eleven weeks of lost time from work.

Mr. C. was employed on November 27. Just before noon he scratched his finger on a nail. As the plant closed down at noon because of Thanksgiving holiday on the twenty-eighth, Mr. C. decided not to follow the foreman's order to report to the doctor. The foreman

who was supposed to see that iodin was applied simply told the man to use it. The next day the finger was badly inflamed. Instead of calling at the doctor's office (open at all times), Mr. C. saw a doctor who temporized with it. The next day this doctor took him to a hospital and opened the finger. This man failing to show up after the holiday and neglecting to report any reason, was considered a "floater." A week later, however, his doctor called the plant surgeon in consultation as the infected finger had to be amputated. The patient lost eight weeks time and became a compensable case.

In both of these examples it is quite evident that the prevention régime which should have been in force had fallen down. First, the foreman in the case of Miss B. failed to instruct her in the means of protecting the spindle point to prevent injury. She was not told regarding the use of iodin or reporting to the doctor at once. Neither was she instructed as to the means of reaching the doctor in case of injury or of complications from same arising after she reached home. Again in the case of Mr. C. the foreman neglected to follow instructions in regard to preventing infection. He also forgot about this slight injury when he dropped the man from the pay roll without investigating the cause of his absence. In both cases the fact that they were new employees made it possible for these conditions to develop without any special blame being attached to anyone.

These cases happened years ago. With such experiences as a teacher, it soon became evident that every effort must be made to educate at once every new employee in every preventive procedure in operation in the plant.

The following steps have been taken to accomplish this early instruction of new employees in accident prevention in this concern:

I. Every applicant for work must be examined in the doctor's office. The nurse and the doctor seeing each case must, as a routine, tell him of the purpose of the office and especially instruct him that in case of an injury he is to report to the doctor at once.

II. The employment manager hands each new employee a little leaflet telling of the various activities of the plant looking to the welfare of the employees. In this he is told of the purposes of the doctor's office and his share in the accident prevention methods in vogue.

III. In the department and elsewhere he sees signs telling him to use iodin at once and report to the doctor at once in case of injury no matter how slight it may be.

IV. The foremen have standing orders to carefully instruct every new employee in every form of accident prevention connected with his work in particular, and with the plant in general.

Recent statistics gathered from the iron and steel trades by the

U. S. Department of Labor illustrate this relation between labor turnover and industrial accidents as follows:

1. Accident frequency rate per one thousand, 300 work days, of six months' experience and under............ 111.3
2. Accident frequency rate per one thousand, 300 work days, of three to five years' experience.............. 42.4

It is evident that every industry must resort to more strenuous educational campaigns with new employees along lines of disease and accident prevention in order to accomplish greater results in this direction. Constant appeals to the old employees to help educate the new workmen and develop the spirit of prevention among them is one of the best methods which can be adopted.

Part III
INDUSTRIAL MEDICINE

CHAPTER XXIV

MEDICAL EXAMINATION OF EMPLOYEES

The constant supervision of the health of employees leads the physician into many and varied activities. He must meet many of the problems of the public health officer, the general practitioner, as well as those of the specialists. But above all else he must be a thorough diagnostician.

Early in his work the alert industrial physician realizes that he is in the most strategic position to diagnose disease early and, by instituting proper treatment at once, to prevent many conditions which ordinarily would become serious. This is due to the fact that he sees great numbers of cases at the very beginning of their troubles. As a rule, a man or woman taken sick at work goes home, tries home remedies, and lies around for a day or two before calling in the family physician. This delay often allows the disease to develop to such an extent that many days are lost from work. But when doctors in whom the employees have confidence are at hand they will be consulted at once.

It behooves these doctors therefore to be constantly on the alert to discover any threatened conditions. The prescribing of drugs without a thorough examination to ascertain their need, or the careless examination without carefully weighing every symptom, will sooner or later result in some preventable mishap which will cause both suffering and financial loss to the employee and will reflect seriously upon the ability of the physician.

Through centuries of scientific investigations our profession has developed more and more exact means of diagnosing disease. Three basic principles form the very foundation of all diagnostic effort; namely, the history, the physical examination, and the various laboratory examinations. To be thorough all of these must be carefully weighed in every case where the least suspicion of disease exists.

The physician dealing with diseased patients, or curative medi-

cine, must utilize all of these methods in practically every case. But the physician supervising the health of large groups of people, dealing largely in preventive medicine, where he is in a position to study the normal human mechanism in thousands of cases, must constantly watch for suspicious symptoms or signs and submit those individuals to the most thorough examination.

This routine examination of large groups of people in order to discover the diseased individuals among them develops a different type of medical man from the one who is brought in constant contact with the diseased patient. It is a common observance among industrial physicians that the new doctor on their staff discovers many more cases of tuberculosis, of heart disease, and of other conditions, when making routine examinations of employees, than the doctor trained in this work. This is due to the fact that the average physician is trained by examining diseased people where findings are usually present and where these findings can be interpreted as the cause of the symptoms. But when a man is examined who has no symptoms and yet presents a few adventitious sounds in his lungs, or a peculiar heart tone, it is difficult for this doctor not to explain the same in pathological terms.

It is very essential therefore for the industrial physician to develop a keen sense of the normal in the human body. He must recognize that certain changes, the result of previous disease, or of certain working conditions, or of numerous other causes, may occur in the human organism which will give signs and even symptoms and yet are not incompatible with a normal, healthful existence for that individual; while other signs of changes in the body, even when the man complains of no symptoms, may be the earliest warning of a pathological state. In the latter case the patient must be submitted to a most thorough examination, the cause of the sign discovered, and the proper steps taken to abort a condition which if neglected may result seriously.

It is utterly impossible to lay down hard and fast rules whereby the beginner in industrial medicine can know when to submit an employee to a complete examination which involves all laboratory tests, or when to feel satisfied with the routine physical examination with the ordinary laboratory tests. Neither can one definitely say just what physical handicaps are sufficient cause for rejecting an applicant for work, while others are not of a nature to interfere with employment. Nor will rules always explain why a certain employee should be sent home for some minor condition while another employee with a similar trouble can be allowed to remain on the job knowing that his resistance will overcome the condition.

None of these problems is solved by rules. It is only after years of experience that one becomes expert in weighing these matters and solving them with accurate judgment. The best rule is to always

give the employee the benefit of the doubt and meet each problem in the safest manner for the individual concerned.

In a large industry hundreds of employees come to the doctor's office every day; and the more reporting the greater is the opportunity for health supervision. It is impossible to examine all of these people and further it is not necessary. Certain ones come for their routine examinations; others because of accidents, or because of some slight symptom; while others report for various kinds of advice. The medical staff, including the nurses, must be so thoroughly trained that it is constantly on the alert for that sign, symptom or even casual remark on the part of each employee which indicates the need for an examination and study of his case.

Others who are examined must be put in one of three classes: normal, no findings; pathological, definite findings; suspicious, indefinite findings. Those in the first group require no further consideration until some condition arises which indicates another examination. Those in the second group must be diagnosed and placed under observation and proper treatment. In the third class fall those cases which reveal findings which must be studied before the employee can be definitely assigned to either the normal or pathological groups. The latter make up the great bulk of re-examination cases. Many employeees are found with some suspicious finding which on re-examination has disappeared. For example: The case which shows a sugar reaction should be examined at least three times before pronouncing it diabetes as many of these are only transient glycosuria.

If every medical staff of an industry will develop a keen sense of detecting the employees needing examinations, plus the routine examination of certain groups, and then will place every employee examined in one of the above classes, it will have established a firm foundation for an efficient system of health supervision.

The medical examination of employees necessitates engaging the services of a greater number of physicians, and enlarging the emergency doctor's offices to include examining rooms and laboratory facilities. All of this means a greater expense to the industry. Therefore, in order to expect industries to adopt such a plan the industrial physician must be able to present a feasible system backed up with the strongest evidence that it is a good business proposition.

The arguments in favor of an examination of all employees of any industry are based upon the following facts:

1. That for greater efficiency an employer has the right to demand a healthful, physically and mentally normal, working force.

2. That an employee is justified in demanding a healthful, sanitary working place, uncontaminated by diseased fellow employees.

3. Good business, as well as a humanitarian spirit, demands the conservation of the life and health of employees.

4. That the medical staff of an industry is employed to act as experts in accomplishing the above results.

In the past the care of accidents has been the chief duty of the company surgeon, with very little attention paid to the health and working ability of the individual employee. Likewise, concerns having company surgeons failed to realize the great advantage at their disposal for increasing efficiency by utilizing the expert knowledge of these men.

Conditions are changing. To-day we see many of our industries employing safety engineers, experts on ventilation, visiting nurses to care for the sick employees and to better their home conditions, and a staff of physicians trained to diagnose diseases in their incipiency, endowed with a great enthusiasm for results, and a knowledge sufficient to master every detail that could possibly lower the resistance of the working force.

Frequent inspections of employees and their work-rooms, instructions in hygiene, sanitation, and health by personal talks, lectures, and printed articles, will increase the standards of health. But the systematic medical examination of employees is the method par excellence in this fight for better health among our working people. By this means the doctor comes in touch with each employee, giving advice and instructions where necessary and establishing thereby a personal contact between the medical staff and the working force. Many diseases are discovered in their incipiency while still curable, thus involving the least expenditure of time or money and therefore directly benefiting both the employee and the employer; whereas, otherwise, the employee would continue at his work with an inestimable, gradual loss in efficiency, until his disease had become incurable, or,at best, could only be controlled. Again, by this system of physical examinations a great many communicable diseases, for example, tuberculosis, are diagnosed and eliminated from the working force, protecting thereby healthy employees from an imminent source of infection—their diseased fellow worker.

Every employee, male and female, from the head of the concern down, should be examined. Naturally, the greatest interest should center on the present working force, and here the physical examination of employees should begin—there should be a general house cleaning. This, of course, will take a great deal of time, depending on the size of the working force and number of doctors employed. The best method is the systematic examination of employees department after department until all have been examined. But the examination and re-examination of the old working force is inadequate unless the

portals of the industry are guarded. Therefore, an examination of all new employees is the second essential in raising the health standards; likewise, it is the first essential in protecting the concern from workers who are unfit because of disease.

When to examine these new employees must be determined by each industry. The ideal time is before beginning work. From a practical basis, however, this is frequently impossible; for instance, when a large number of people are employed, often temporarily, and upon very short notice. Therefore, a flexible rule must be adopted so that, where possible, every applicant for work shall be examined before employment. Otherwise, they shall be examined the first week or month of their service.

Another ideal arrangement in this scheme of medical supervision would be the repetition of these general examinations at stated intervals—say, every six months. Again, this in not practicable, especially in our larger industries, owing to the number of doctors necessary at all times to accomplish this. A comprehensive yet workable system which the writer has gradually evolved during the last ten years for the examination and re-examination of employees in a large industry of Chicago having over 14,000 men and women, is adaptable to any concern.

This consists of a constant, careful watch for employees below par by the medical staff, nurses, managers, floor bosses, division heads, and even the employees themselves.

Any employee who at the first examination is found to have the least suspicious findings of any disease is filed under the heading of "Re-examination." In the course of a week, month, or three months, according to the doctor's decision, he is recalled and again examined. This is repeated as often as his condition warrants.

Other types of suspicious cases are assigned to a nurse to have temperature and pulse watched morning and evening for stated periods. If any abnormal condition is found in the temperature chart of such an employee, he is relieved from work until a final diagnosis is made and his future care outlined. Again, when an employee returns to work after some chronic disease has been cured or arrested, he is frequently examined to guard against a recurrence.

All employees who become sick while at work are sent to the doctor's office for a "pass" before going home. And all employees absent on account of illness, of even one day's duration, must secure a permit from the physician before returning to work. By this rule, the medical staff is enabled to watch those employees most frequently absent on account of sickness, and thus quite often some incipient disease is revealed as the cause of this decreased working capacity.

When a concern has a benefit association the examination of every employee joining this organization furnishes another source of securing re-examinations.

The visiting nurse is one of the best adjuncts to the doctor's office. While visiting a sick employee, she often discovers conditions at home that enable the physician to arrive at the true nature of the employee's trouble which might have been overlooked in a routine examination.

Letters and personal talks by the medical staff, backed by the influence and instructions of the management of a concern, will soon arouse all sub-managers, floor bosses, and division heads to take a great interest in the health of workers under them. In time they learn to recognize the early signs of disease and are constantly sending employees for re-examinations.

This educational system does not stop with those in positions of authority, but soon extends to the employees in general, and if their confidence is once gained, these become "medical missionaries, spreading the value of the examination throughout the working force."

Periodical examinations for occupational diseases, as prescribed by certain State laws, where thoroughly made, furnish another opportunity for supervision of health. Concerns which are forced to employ men in dusty, dark places, or where disease is more prone to develop, should always provide frequent medical examinations.

To recapitulate: the various channels through which re-examination of employees can be obtained are:

Those found at first examination to be below par.

The repeated examination to guard against recurrences.

Those becoming sick while at work.

Those returning to work after an illness.

Those found by the visiting nurse needing examinations.

Those referred by managers or others in authority.

Those referred by fellow employees.

Those examined for benefit association.

Those examined for occupational diseases, or where their work indicates the necessity.

The following table shows the great number of examinations of employees which can be made during the course of a year, and the number of re-examinations made possible by adopting the above system. The examinations of old employees were in practically every case re-examinations as the old working force had been thoroughly "house cleaned" six years before at the time the system of examinations of all applicants for work was adopted. The statistics were secured from the records of this same concern which, as stated, employed approximately 15,000 men and women.

Table 9

Examinations and re-examinations were secured through the following channels:

Examined for employment	17,742
Old employees completely examined (including laboratory tests)	7,088
Old employees partially examined	37,906
Total	62,736
Re-examinations	
Found at first examination to be below par	4,871
Examined to guard against recurrences	4,251
Reporting for pass home on account of sickness	8,272
Reporting for pass back to work after sickness	18,800
Referred by the nurses or others of medical staff	1,983
Referred by managers, fellow employees, or reporting of own accord	4,264
Examined for benefit association	1,299
Examined because of occupational disease hazards	1,254
Total	44,994

The partial examinations referred to in the above table were those where some local condition was being followed up and where repeated thorough examinations were not necessary after they had once been made.

Through these same channels a repeated inspection of employees can be made: for instance, every complaining employee who comes to the doctor's office should have his temperature, pulse, and weight taken. If these are normal and his history is negative and his record shows an examination within the last year, further examination will not be necessary.

Whenever an employee with a contagious disease is found working in close contact with others, a careful examination of every man and woman in this department should be made, to ascertain if any have been contaminated.

To make such a system possible, every concern must provide a suitable doctor's office at the plant. This should consist of waiting rooms, history, examining, and consultation room, and a general office, as well as an operating room (the care of the injured must always form a large portion of the company surgeon's work), and a well equipped laboratory.

The size of the medical staff naturally depends upon the number of employees and the nature of their employment. For the system of medical examinations above outlined, in a concern employing 5000 people, at least two physicians and four nurses would be necessary to accomplish the work. Careful history sheets and records with an adequate tickler system should be kept on every case.

THE EXAMINATION

This should consist of the following, and is applicable to both sexes, with only a few exceptions, which are noted.

1. History of patient on regular blank.
   (*a*) Personal and family history.
   (*b*) Home conditions and financial conditions.
2. Temperature, pulse, height, and weight. (These can be obtained by nurse.)
3. General inspection—color, nutrition, any deformities or congenital malformations, gait, etc.
4. Inspection of mouth, teeth, throat.
5. Inspection of eyes—Snellen's test.
6. Inspection and palpation of neck.
7. Thorough examination of bare chest.
   (*a*) Lungs.
   (*b*) Heart.
8. Examination of abdomen, genitalia, and extremities in men.
   (*a*) Hernias.
   (*b*) Venereal disease.
   (*c*) Varicosities or flat-foot.

   Where history of case indicates some abdominal or other trouble in the female employee, the services of the doctor for a further and more thorough examination, in the presence of the nurse, or the next day when the mother can come with patient, are offered. If refused, send to family physician.
9. A routine urinalysis in all cases—albumin, sugar, and microscopic.
10. Blood-pressure and blood examinations in all cases where history and examination show they are indicated.
11. Other laboratory tests such as bacteriological examinations, stomach analysis, Wassermanns, *x*-ray examinations, etc., should be provided when needed, either at the plant office or at an outside hospital.
12. Examination of the teeth of employees by a dentist who recommends treatment when needed, is a valuable adjunct.
13. Examination of eyes by a specialist is indicated in all cases of defective vision found at routine examination.

Routine Procedure for Examinations

The applicants for work and those employees reporting for routine examinations can be handled rapidly and efficiently by the following system.

1. Each patient enters with a pass from the employment department or from his foreman. A girl punches the time of entrance

to the doctor's office on this pass. This prevents employees from becoming lost and spending too much time in the office. It also gives a check to the foreman on the length of time spent in going and coming from the doctor's office.

2. Sits in waiting room until a record girl finds and brings employee's history sheet to the nurse in charge. The records are pulled in turn from names on the passes (2 minutes).

3. Enters one of the history rooms where nurse takes history, secures pulse, temperature, weight and height record, makes eye test (Snellen) and records all these on the employee's history sheet (5 minutes).

4. Messenger takes employee to dressing room where he disrobes, urinates in specimen jar (boy marks and places in compartment basket), and then goes into the examining room. The physician stays here constantly, the cases coming to him. By handling ten employees at a time the messenger boy is able to keep ahead of the doctor and to take specimens in batches of ten to the laboratory where they are examined and recorded before the examination is made (5 minutes).

5. Employee dresses and goes to dentist or other specialists for special examination (10 minutes).

6. Passes out before a nurse who inspects his record to see that it is complete and to note whether he has been referred for some special test or examination. Records are collected by this nurse.

7. Girl punches time of leaving on his pass which she has retained.

By such a plan the employee that needs no special conference, no consultation with others, no treatment or advice can have his examination and record completed and leave in 22 minutes.

Other employees meanwhile are seen by the nurses, the surgeons in charge of dressings and the chief of staff who acts as a consultant, without interfering with these examinations. Eight hundred and seventeen patients have been seen and cared for by eleven doctors, spending from three and one-half to four hours each at the office, and assisted by twelve nurses in the morning and five nurses in the afternoon.

The examination of girls is conducted in the same way except their examination only includes head, neck and chest. Careful history is obtained in each instance however to ascertain if she should be referred for more thorough examination.

The question of the history sheets and other records used in these examinations is dealt with in Chapter XII.

Some Statistics of Examinations

It is to be deplored that physicians engaged in this work have been entirely too busy to keep careful statistics. Managers of industry

often cannot see the value of assigning the necessary clerks to compile statistics. Valuable information is contained in the records of these industrial dispensaries which should be combed out and contributed to medical literature.

Recognizing the need of some uniform method of keeping records in order to facilitate this compiling of statistics, Dr. Warren of the U. S. Public Health Service is working on a record sheet which he hopes to have adopted by all physicians in industry. Dr. Tucker of the Conference Board of Industrial Physicians is also preparing a record card. It is to be hoped that within the next year a simple, uniform system of record keeping will be adopted by all industrial dispensaries.

I have collected the number of diseased conditions found by medical examinations in twelve different industries, representing almost every type of work. The total number of examinations made was 276,420 during a period of five years. The relative incidence of diseased conditions found is divided for purposes of comparison into the following groups:

Group I. The author's findings in 112,000 examinations among employees: engaged in clerical work, 35 per cent.; skilled light occupations, 20 per cent.; heavy manufacturing and laboring work, 45 per cent. The proportion of female help was about 42 per cent. and of male 58 per cent. The average age was twenty-six years.

Group II. The findings of the U. S. Public Health Service in 936 steel workers.

Group III. The findings of the U. S. Public Health Service in 2086 male garment workers.

Group IV. The average findings of ten surgeons in ten different industries representing clerical, light manufacturing, heavy steel, electrical, rubber and other forms of manufacture.

In going over these statistics from the various industries one is impressed with a number of facts:

1. The majority of industrial physicians are not paying sufficient attention to foot conditions and deformities of the extremities. Undoubtedly more careful selection of work for employees so handicapped would improve efficiency.

2. Only a very small number of these physicians are making careful tests of vision, otherwise the percentage of eye conditions found would have been higher. In Group IV under defective vision I have reported the average percentage of two concerns only.

3. One is impressed with the small number of blind or partially blind men that are being employed by these industries. Is this because of the compensation laws?

Conditions found	Group I, per cent.	Group II, per cent.	Group III, per cent.	Group IV, per cent.	Average, per cent.
1. Tuberculosis, active...	01.7	00.92	3.00	01.40	01.755
2. Tuberculosis, suspected or arrested ..	02.10	.....	02.00	.....	01.025
3. Other lung conditions.	03.10	07.17	10.10	05.30	08.418
4. Organic heart disease.	02.20	02.90	01.80	02.25	02.288
Functional heart conditions	03.00				
Arteriosclerosis.....	03.10				
5. Nephritis............	00.80	00.00	00.50	00.20	00.350
6. Albuminuria..........	01.70	05.00	02.30	03.90	03.225
7. Rheumatic conditions	05.00	06.60	00.25	06.20	04.512
8. Hypertrophied or diseased tonsils.......	40.00	26.80	13.00	03.90	20.925
9. Hernia...............	03.20	12.60	07.50	04.40	06.925
Unprotected by truss	02.50				
Varicocele, hydrocele and undescended testicle............	00.80				
10. Varicosities..........	01.00	09.63	03.00	03.20	04.208
11. Flatfeet	04.00	32.80	29.00	05.20	17.750
12. Amputated members	02.50	04.28	03.00	01.30	02.740
13. Deformities.........	.....	21.90	00.80	01.90	06.150
14. Epilepsy............	00.04	.....	00.05	00.02	00.028
15. Defective vision.....	35.00	.....	.....	33.90	17.225
Blind one eye......	00.40	00.30	00.66	00.10	00.365
Blind both eyes....	....	.....	.....	00.01	00.003
16. Deafness............	04.00	.....	.....	02.30	03.100
17. Skin diseases........	04.00	.....	.....	02.40	03.200
18. Defective teeth......	93.00	.....	.....	56.90	37.475
Anemias	03.10				
Diabetes	00.06				
Contagious diseases	00.30				
Venereal diseases..	00.60	.....	.....	01.20	

4. The percentage of tuberculosis cases is higher among the garment workers of New York. These figures were taken before the working conditions of this group of employees were improved. I am told by different physicians familiar with this group of employees, that their tuberculous incidence has decreased in the last five years.

5. The circulatory conditions among employees cause much inefficiency and lost time unless these individuals are carefully supervised in which case they become, on selected duty, very efficient. The incidence of this organic condition is in proportion to the number of rheumatic conditions found among employees and from the great number of diseased tonsils and bad teeth found both of these conditions can be accounted for.

6. The hernia figures are most interesting. In the industries with the heaviest occupations the rate is usually highest—one physician in a steel mill reporting 14 per cent. Dr. Schereschewsky's figures show a much higher rate in the steel employees than he found in garment workers, or than I found among employees whose work was of a lighter nature. This would seem to bear out the contention of some that if hernia is not a traumatic condition it can certainly be classed as an occupational condition, being more frequent among those submitted to continuous, arduous work.

7. The venereal incidence is smaller than that found in the army. Employees with venereal disease do not seek employment as a rule where physical examinations are conducted, and they avoid paying visits to the doctor's office for fear of losing their job if their disease is discovered. A more generous policy toward these cases by employers would be of the greatest help in discovering them and safeguarding all concerned.

No exhaustive studies have been made as to whether all these efforts in supervising the health of employees have resulted in a marked reduction in morbidity or mortality. Many examples, however, can be given to prove that they have.

The author found forty-five cases of tuberculosis in 1909 working in a plant. Five of these died from the disease because they were discovered in an advanced stage. In 1913, five years later, one hundred and one cases of this disease were found with only two deaths resulting. This reduction in the death rate has been constant ever since the general house cleaning took place, eight and nine years ago.

In 1915 there was an increase of 28 per cent. in the membership of the Benefit Association of this same concern, as compared with three years previously. In spite of this increase there was a decrease of 20 per cent. in the amount of sick benefits. About the time we were feeling unusually happy over these figures there was an epidemic of so-called grip which soon destroyed this showing. It will only be after years of careful comparison that the real benefit of these efforts can be shown in actual figures.

During the epidemic referred to above the death rate from pneumonia greatly increased in this community. In this concern however out of thirteen hundred cases of "grip" during a period of three months there were only three deaths from pneumonia. The measures taken to discover the disease early and to free the plant at once of the infected cases accounted for this reduction.

Two of the largest industrial insurance companies of the country, the Prudential and the Metropolitan have prepared an interesting table showing the reduction in the mortality rate from a few specific causes. As all those engaged in improving the health conditions of

employees are responsible to some extent for these results the table is herewith reproduced.

INDUSTRIAL MORTALITY EXPERIENCE

Reduction in Mortality from Specific Causes, 1911 *to* 1914

Causes of death	Prudential			Metropolitan		
	Death rate per 100,000		Per cent. reduction	Death rate per 100,000		Per cent. reduction
	1911	1914		1911	1914	
Typhoid fever	18.5	12.5	32.4	19.3	13.6	29.5
Measles, scarlet fever, diphtheria, whooping cough	58.9	47.7	19.0	62.7	51.3	18.2
Tuberculosis, all forms	201.4	182.2	9.5	195.3	176.1	9.8
Bronchitis (acute and chronic)	17.2	14.0	18.6	14.4	11.0	23.6
Pneumonia	124.1	110.3	11.1	108.4	95.0	12.4
All external causes	102.8	95.3	7.3	95.6	85.9	10.1
Cirrhosis of liver	17.2	17.1	0.6	16.9	13.9	17.8
Total above causes	540.1	479.1	11.3	512.6	446.8	12.8

These data are based upon exceptionally accurate statements of cause of death and upon very close approximations to the number of the living exposed to the risk of death. The two experiences are strikingly similar, they both represent large exposures of industrial workers and both show a quite remarkable reduction in mortality from the causes specified, all of which are largely preventable.

The examination of employees is demonstrating a great social and economic problem which sooner or later must be faced: that is, what is to be done with those diseased workers who are refused positions in one concern after another because they cannot pass the physical examination? Some arrangement must be made by the States, by industrial insurance, or by the corporations themselves, to care for these unfortunate men and women who are found below par and not desirable as employees.

The problems which are unfolding because of this new line of medical work in our industries are many and serious. This work has surely demonstrated the great human wastage which has been going on since the birth of our nation, and the appalling need for some means of salvaging the disabled employee whether his disability is the result of industrial conditions, or otherwise.

When an industry adopts this system of examination, the number of employees found suffering from incipient disease will be excessive. For in the first year or two the ratio of those found diseased increases directly with the number of examinations. After four or five years,

however, the number of diseased employees in the working force will be smaller compared with the number of applicants and six month employees found diseased (Fig. 52).

The attitude of the employee toward this medical supervision of his health is very gratifying, as a rule. He recognizes its great value to himself and his family. Very rarely, and usually only in the very ignorant class, does an applicant or an employee refuse to be examined. If the management is standing firmly behind the doctor, even these few cases can be persuaded.

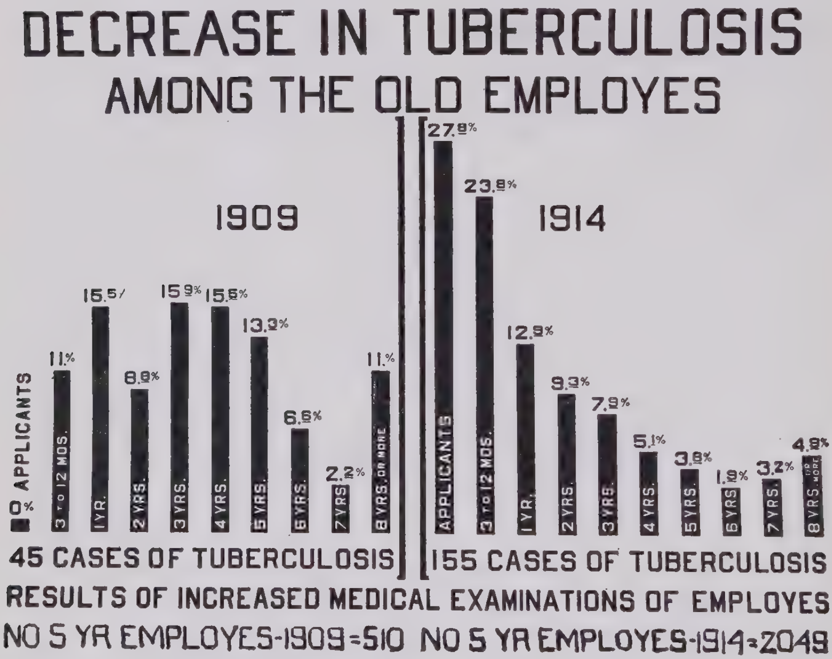

Fig. 52.—Medical examinations caused a marked reduction in the tuberculosis rate among the old employees even though the number of these was four times as great in 1914 as in 1909. This is true of many other chronic diseases.

Medical work is growing rapidly in favor with employers as their education along these lines is progressing. Labor unions are also in favor of this work, providing it is done from a humanitarian standpoint. But if done for the purpose of picking only the healthiest, most fit employee without any regard for the welfare of those beginning to wear out under the strain, then they are opposed to it.

Five years ago it was my experience to find family physicians opposed to all industrial medical systems. A diagnosis of incipient tuberculosis, for instance, was often the cause of a severe arraignment from the family physician and the enmity of the employee and

his family. If, however, the company physician has thoroughly diagnosed his case by repeated examinations and careful laboratory study, he is in a position to stand his ground, and the subsequent course usually justifies his position. In time the family physician comes to recognize the great value of this careful supervision of his patients while they are at work, especially if the employee is referred to him for treatment, independently or in co-operation with the company physician.

CHAPTER XXV

MEDICAL EXAMINATION OF APPLICANTS FOR WORK

In the various armies of the world one of the functions of the medical officers has always been the physical examination of new recruits. This was done for the purpose of picking only the physical fit as it was felt that only such men could stand the hardships of a soldier's life.

But the economic demand for man-power in all the countries engaged in this world war has forced them to adopt a plan of physical selection for work of those men not quite fit for general military duty. In our own country after the course of a year we are utilizing this class of men. Soldiers unfit for general military duty are being assigned to development battalions where they are given training according to their physical ability to stand it, and then are carefully classified, by qualified medical officers, and assigned to selected duties where they can be efficient in spite of their physical handicaps. Draftees with physical handicaps are also being sent to camps for limited duty men and, after their physical classification, are assigned to properly selected occupations. Tens of thousands of able-bodied soldiers will thus be freed from lighter duties for the heavy combat service.

This radical change in the practices of the army, which has enabled them to utilize man-power to a greater extent than ever before, will have a far reaching influence in the employment practices of our industries. Henceforth the new recruit in the industrial army will be classified physically, as well as technically, and assigned to work by considering both qualifications if industry desires the most efficient system.

Long before the war a few of our industries had begun a thorough, systematic physical examination of applicants for work. In fact, the experiences of some of these industries, where this procedure had proven both practicable and profitable were influential in establishing these new standards in the army.

There are isolated examples of the examination of applicants for work prior to 1912 but it was about this date that the practice was introduced to any extent in industry. It is often stated that examination of applicants and of employees did not start until after certain states had enacted employees compensation acts. True the

enactment of these laws gave a marked stimulus to the method because many concerns felt that it was necessary to rule out the defectives in order to protect themselves from liabilities. The chief surgeon of one of the largest industries in the country expressed it thus:

"No such examinations were conducted by us prior to the compensation act. It was thought best to let every man apply for a job, try himself out, if he could stand up under the work and wished the job, it was his. At the present time physical examinations are being conducted so as to fit defective men into such posts in our industry as will interfere least with existing defects. The physical examinations also disqualify many men seeking employment. The compensation liability is too great. The industries do not like to discriminate against men seeking employment, as their services are much needed. A man with one eye is often a good man for his post yet such a defect at present disqualifies. 'Everybody is doing it,' and it was not until we were convinced that we were getting only the refuse of the railroads and steel mills, men who could not qualify in competitive physical examinations, that our company began such physical examinations in May, 1916."

But those concerns which really initiated medical examinations did so before any such laws were enacted, and the basis for so doing was not selfish, but solely for the protection of their working forces. Few of us in the beginning realized all the ramifications this procedure would have in the economic and social existence of our country. Some of these ramifications have been for good and some for evil but an equitable adjustment for all concerned is gradually taking place. And it is an efficiency measure which both employers and labor unions now recognize as here to stay.

In Chapter XXI I have referred to the old system of throwing men into jobs without knowing their fitness for the same and the human waste and financial loss to employers which such a system involved. This hit or miss method of employment is still in vogue in the majority of industries. It is one of the chief factors in the high percentage of labor turn-over. Inefficiency on the job, needless premature breakdowns the result of overwork, unnecessary accidents, misunderstandings between boss and workman, and the discontent of labor can more often be traced to poor health conditions than to any other one cause. The physical selection of men for proper work combined with proper health supervision is the cure for many of these difficulties.

WHEN TO EXAMINE

The only proper time to examine an applicant for work is before he is employed. No working force is sufficiently protected from con-

tagious diseases in applicants if these are allowed to work for a number of days before being examined. The defective new employee may cause an accident to himself or others during those early days of work before he is examined. The loss in inefficient labor, in breaking an employee in to a job and then losing him, and the uncertainty on the part of the the employee as to whether he will be retained or not, all point to the importance of making this examination before he goes to work. Above all it is a gross injustice to employ a man and then a month later, because he has some physical defect which is found at the examination supposed to be given to applicants, discharge him because of physical disability. Rightfully he asks if he hasn't been doing his work efficiently in spite of that handicap.

An exception to this rule may be made in the case of employing a large number of men at one time for temporary work as before the Christmas rush. But that concern is the wisest, and after all the most frugal, which employs more doctors at such a time and maintains its standards.

This true example can be given illustrating the bad effects of postponing this examination of applicants.

J. B. was employed by an electrical concern as a mechanic. Physical examinations of applicants were required by this industry but the doctors were three months behind in their work. Finally J. B., after 3 months of efficient work as a mechanic, was examined and it was discovered that he was blind in his left eye. This did not interfere in his work but it added to his liability to the concern in case of an injury to his good eye. Therefore he was dismissed. The doctor who handled this case was ashamed of it and framed up an excuse with the man's foreman in order to fire him. If this was sufficient reason for not accepting the man for work then he should have been examined and refused employment when he applied. As it was a great injustice was done the man and his future was jeopardized.

REASONS FOR EXAMINATION

The industries adopting this system did so for one of the following reasons. You will note that some of them are altruistic, good business reasons, while others have a selfish basis only.

1. To maintain the standards of health among the old employees.
2. To enable the selection of work according to the physical qualifications of the applicant.
3. To pick only the physically fit.
4. To protect the concern from employees who might add to their accident liability, thus increasing the insurance premium.

5. To keep out the labor agitator and other undesirable employees (claimed by opponents to the plan).

In most concerns where examinations of applicants are conducted the old employees have been thoroughly examined, industrial hygiene methods are in vogue, and all forms of health supervision established. It is only logical therefore that as far as possible they desire to maintain these standards of health. The more comprehensive their standards are however the more broad-minded, as a rule, are they toward employing handicapped individuals.

Applicants with contagious conditions are not employed because of their danger to fellow employees. During the course of one year in an industry conducting physical examination the following contagious diseases were found by the author and his associates among 8000 applicants and were a cause for rejection:

	Cases
Tuberculosis	102
Syphilis (active)	10
Gonorrhea	16
Diphtheria	8
Scarlet fever	2
Measles	6
Mumps	6
Streptococcic sore throat	18
Small-pox	1
Traucoma	1
Total	170

It is self-evident that the health of employees in this industry was greatly protected by preventing these applicants from going to work. The financial saving to the concern by preventing at least five possible epidemics among their working force cannot be estimated.

In spite of new theories in regard to the absence of danger from mingling with tuberculous patients I contend that it is a much safer business policy to protect the employees from intimate contact with this disease in their working rooms.

Other applicants are rejected because they have some diseased condition that makes work of any kind dangerous for them. No health standard can be maintained if a man with a broken compensated heart, or a girl with an advanced exophthalmic goitre is allowed to go to work. The occupation, no matter how carefully selected may be detrimental to their health and cause much lost time from work on the one hand and great physical damage to them on the other. This does not mean, however, that all organic diseases are causes for rejection.

The second reason for examining applicants, namely, to enable the selection of work according to their physical qualifications, is one of the most logical business reasons which can be advanced for this procedure. Every efficiency engineer recognizes the value of placing "round pegs, in round holes." No method of picking these pegs is complete that does not include a physical examination.

Examples have already been given illustrating the human danger and the financial loss that can follow the usual system of throwing men into jobs without any thought given to their physical qualifications. The example of the man who was employed as a crane operator and whose crane was responsible for the death of one man and the injury of another is one of the best illustrations we can use. These accidents were attributed to other causes but when the crane operator was finally examined he was found to have an eye condition which destroyed part of his vision, especially his perspective.

The mental qualifications of a man for types of work must also be considered in this selection of the round hole for the round peg. The employment manager usually becomes a practical psychologist and is able to select these jobs properly. But the physician can often detect mental conditions not apparent to the employment man. For this purpose he should talk with every employee and applicant, asking questions and observing his manner of responding to certain requests in order to determine the mental attributes of each. When deemed advisable the suspicious cases should be referred to a practical psychiatrist for a decision as to their mental fitness for work. Every industrial physician can develop this ability of diagnosing mental troubles even though he cannot subdivide the conditions into the many types of nervous and mental diseases.

Even after an applicant has been examined and accepted these mental cases will be cropping out. The majority of them are only functional or temperamental. Often incompatible work will bring the temperamental condition to the foreground.

One employee was recommended for discharge on account of inefficiency by his foreman. Before this was done the employment manager sent him to the doctor for another examination. The man was sullen, morose and above all disheartened. He had been working as a packer during the day and studying as a violinist in the evenings. The fellow employees were rude to him and he could not understand their ways. Physically he was perfect. Mentally he was temperamental. A conference between the doctor and employment manager resulted in the man being transferred to the position of assistant foreman over a department of girl typists. He was told to fix up their working room, make it home-like, give the girls a little recreation for ten minutes in the morning and afternoon. In

six months he had a glee club developed among these employees and other activities started which made the girls enthusiastic about their department and most loyal to their foreman and the concern. The output of work increased over 50 per cent. This man is now manager of a department and is happy in his work. Often the nervous energy behind a temperamental employee can be used as a great dynamic force if directed in the right channels.

Those concerns which adopt this system of examination for the purpose of picking only the physically fit employees may be playing a long stroke of business but they are not assuming their share of responsibility toward society. The handicapped employee is ever in our midst. While he has his brain power left he is able to be efficient in some selected capacity. Unless this opportunity is given him he becomes a non-productive agent and a drain on society. Every concern is benefited by all things which improve the social and economic conditions of their community. Refusal to assume their share of this burden reacts on them as well as on the other industries.

From a recent questionaire sent out in regard to the employment of handicapped men the writer discovered that many concerns, even where physical examinations of applicants were conducted, were employing such men. Those with diseased conditions unfitting them for their work were rejected, but the disabled men, the armless, the legless, the blind in one eye, were being employed. This may be due to the fact that man-power is at such a premium now, but the testimony of most of these concerns would indicate that, where jobs are properly selected, these handicapped individuals make better employees than the able-bodied, and that as far as they are concerned these are permanent employees.

One concern reported that it employed all legless and one armed men who applied and that it had carried out this policy for five years. To-day forty such men work here. Five of these have advanced to the position of foreman, one to a manager. Their reasons for favoring this type of a man were purely business reasons and can be stated as follows:

1. Lessens labor turn-over. These men hesitate to change jobs more than do the ablebodied.

2. Make more loyal employees. They appreciate the opportunity given them to work in a world that has heretofore tried to place them in the scrap heap.

3. Lessens troubles from labor agitators—because of loyalty.

4. Have a greater output. They stick closer to the job, do not move about the plant as much as one with two legs.

5. Are more punctual and have less absenteeism. As a rule they

take a more serious view of life, do not use alcohol, stay home of nights, and avoid exposures that lead to sickness.

6. Take a pride in their accomplishments. The reaction from those days when they thought they were cripples makes them strive the harder to make good. As one of them said: "It takes a lot of extra effort at first to overcome your handicap and then when it is overcome this extra effort ought to push you away ahead of the other fellow."

One employer was quite proud of the fact that he had a number of "cripples" working for him. His chief argument in favor of employing such men was "they worked a lot cheaper than the other fellows." His plant was visited and the lack of incentive for these employees which was witnessed there accounted for them still being "cripples." The handicapped man who has overcome his condition and made good is never a "cripple."

So, the concern which is picking only the physically fit employees may not possess such a strong business sagacity after all. Usually such a one is selfish in other matters and sooner or later this selfishness will be their undoing. The lack of loyalty on the part of employees who cannot respect their employer is an ever present, incalculable loss to any industry.

With the enactment of employees' compensation laws a great stimulus was given to examinations of applicants. Many concerns adopted this measure as a means of protection against the employee who might increase his accident rate. Practically all the state compensation laws hold the employer responsible for total disability when subsequent injury to an already handicapped individual renders him totally disabled. For instance if a one eyed man is employed and by accident he loses the other eye the concern must pay compensation for the loss of both eyes, that is, total blindness.

The tendency of all industrial boards to call most hernias traumatic, and therefore compensable, placed a ban on the employment of men with hernias.

Insurance companies began to raise the premium rate for concerns employing men who were potential accident liabilities. This added greatly to the discrimination against handicapped individuals and forced many to employ doctors to make physical examinations of applicants from this standpoint of protection alone.

No other one thing has caused greater criticism of physical examinations of employees than this attitude on the part of employers and insurance companies. Few could see that neither physical examinations, nor the doctors, were to blame, but rather the compensation laws which placed this injustice on the employer and the handicapped applicant for work.

During the last year the government's plans for the reconstruction, re-education and re-employment of the returned disabled soldier has injected a new issue, a new viewpoint into the question of employees' compensation. All agree that these disabled soldiers must be employed by industry. All agree also that the employer should not be held responsible for the increased liability due to the handicapped condition of these men. Therefore committees, congressmen and state senators are considering means of so modifying all compensation acts that this injustice will be eliminated. When it is so modified it must include the disabled of industry as well in its interpretation. Thus will the last excuse for using physical examinations of applicants as a means of discriminating against the disabled man be cast aside.

Many union labor leaders at first bitterly opposed the examination of employees. They contended that it was only a means of discrimination against the labor union men; of keeping men who were radical in their views out of the working force by claiming that the doctor had found them physically unfit.

I doubt if any industry has ever used this as an excuse to so discriminate. But there is evidence that the doctor has been asked to use sickness as an excuse to get rid of some undesirable employee. Often it is hard to fire a man and the doctor's office will offer an easy solution to this difficulty if the the doctor will only follow directions. Knowing this to be a fact we can conceive of these fears, of the labor union men, as having some foundation.

It is imperative that the medical staff of an industry be absolutely square at all times with both the employee and the employer. He cannot favor one against the other. His decisions must be made altogether upon the evidence of the case. Subterfuges which could reflect upon his professional honesty will soon rob him of the respect and confidence of all.

REJECTION STANDARDS

It has often been suggested that a list of diseases and the subnormal conditions for which men should be rejected should be prepared by a representative group of industrial surgeons. The standards for rejection in the army have been offered as a basis. Such a plan would work great injustices on thousands of individuals. The variations in occupations, hours of labor, plant conditions, attitude of employers toward employees and many other things on the one hand, and the variations in the seriousness of specific conditions in different individuals and the interpretations of the different conditions by the medical men on the other hand, make such a standardization of specific causes for rejections impossible.

The case of each individual must be considered separately, and the

decision as to his fitness for work must depend upon his individual physical and mental qualifications and the nature of occupations available in the given industry.

The Ford Motor Company claims to have the policy of "No Rejections for Work." Every applicant is given a thorough examination, his physical defects noted, and then he is assigned work where he can be efficient in spite of his handicap. Naturally contagious cases would not be accepted at once. This careful fitting of the job to the man has resulted in the greatest efficiency in this plant. Even men who are blind have been found useful and more efficient than others especially on the finer electrical work, as winding of armatures. There is no attitude of charity in this policy but it is placed on a straight business basis.

For a large concern where many kinds of occupations are represented this policy is logical. But a smaller industry perhaps could not find employment for every type of handicapped individual without introducing the element of charity.

Representing the other extreme are a few concerns which have definite standards for rejection. These reject: all cases of blindness, one eye or both; deafness in both ears; badly infected teeth; cases of tuberculosis or suspicious lung findings; organic heart disease; nephritis; diabetes; all cases of hernia; varicose veins; marked deformities of extremities; epilepsy; any degenerative nervous conditions; syphilis or gonorrhea. These conditions raise their rejection list to approximately 15 per cent. of all applicants. They accept many employees with minor handicaps and therefore cannot be placed in the class of those concerns picking only the most fit material. The latter concerns reject from 18 to 20 per cent. of all applicants

In between these two extremes of accepting all comers and of rejecting all with specific conditions, we find a large group of industries that have adopted the plan of individual selection for proper work.

No definite standard of causes for rejection can be outlined for these concerns but their policy can be stated in general as follows:

1. All contagious cases must be rejected—later they may return for examination.

2. Cases of total blindness are not accepted as a rule. A job may be found for some specific case. One eye blindness is accepted but assigned to work where the hazard to the good eye is reduced to a minimum.

3. Locomotor ataxia, paresis and general nervous conditions are not accepted as a rule, although the milder forms may be placed at selected work.

4. Epileptics are not accepted by the majority. A few concerns

find suitable work for these individuals where the danger of injury resulting during an attack is obviated as far as possible.

5. Tuberculous cases are rejected. Some of the concerns assume the duty of seeing that these rejects are placed under proper treatment by the city, county or with their family physician.

6. Other lung conditions are decided on their merits. An asthmatic may be rejected because the only work available for him is in a very dusty occupation. Careful selection of proper work is necessary for these cases.

7. Organic heart disease with broken compensation is a cause for rejection—for the good of the applicant. Other applicants with heart disease can be very efficient in selected positions where excessive physical strain is not demanded. In a large group of applicants examined for work 3 per cent. were found with heart disease but only one-half of 1 per cent. was rejected. The others, in selected jobs, made excellent employees, were very loyal because they appreciated the fact of being employed, had a decreased sickness rate because they were more careful and were supervised more rigidly, and decreased labor turn-over by staying on the job where these advantages were afforded them.

8. Hernias are a cause of rejection in most of these concerns. This is largely because of the legal liabilities assumed by employing these cases. This fear has been exaggerated, however.

Men with hernias are undoubtedly less efficient on all jobs demanding physical exertion. Even when a truss is worn they unconsciously protect themselves by lessened exertion. Some statistics show a lessened rate of 20 per cent. in these cases. Considering the large number of hernia cases and the small number of men suitable for sedentary occupations it is obvious that many of these cases must be rejected. Wherever possible, suitable work should be provided for them.

Some arrangement should be made where men with hernias could undergo operations. The writer has operated a great many of these rejected cases free of charge and then the concern, with which he was associated, would employ them after recovery. Such men were able to do heavy work and were usually a very loyal group of employees. But this plan smacks too much of charity. As an economic responsibility the state should provide some means of remedying these, as well as other, conditions which have an occupational etiology, or, because of their existence, have an occupational hazard.

Undescended testicle, varicocele, hydrocele and similar conditions have often formed a basis for rejection on the ground that they predispose to hernia. Such conditions should not interfere with employment except where they form a definite hazard and no proper work

can be selected. Many a man with an undescended testicle lying in the abdomen has been rejected, who is just as safe and as capable an employee as any other able bodied man.

9. Varicose veins, especially with ulcers of the legs, often so incapacitate a man as to make him unfit for employment. Again, a large varicosity adds to the hazards of certain occupations. Many such cases must be rejected. But these men on properly selected jobs, which do not involve the combination of heavy work and continuous standing, can make efficient employees. A concern, however, always assumes the liability of a slight injury to the varicose leg causing a serious ulcer and prolonged disability. Relief from this liability on the part of the compensation act, would enable more men and women with varicosities to secure employment.

10. Severe deformities, even the loss of a leg or an arm, should not be a cause for rejection if the industry has work of any kind that could be done by such men. All concerns who have employed such individuals testify to their efficiency.

11. It takes a very broad minded employer who will consent to the employment of venereal cases. The active syphilitic and acute gonorrheal are a menace to the old working force. Therefore they should be temporarily rejected. But some plan must be formed whereby these cases can be reported and forced to take proper treatment, and other forms of protection of society from this menace made. It is a duty of the state to take up this problem at once. A few industries have provided proper care for their employees who contract these diseases but none have assumed responsibility for the diseased applicant.

12. Infected teeth, diseased tonsils, defective vision, lack of protection by vaccination and other remedial conditions are not causes for rejection by most employers. Some, however, have made arrangements, either in their own medical departments, or with outside medical and dental clinics, for the correction of these conditions. Employment is granted on the understanding that the applicant will at once seek proper treatment. Some concerns even arrange a loan of money to these individuals, so that they can obtain this treatment; the loan to be repaid in small weekly payments taken from their wages. No greater efficiency measure, nor better public health act, has ever been initiated in this country. One establishment has extended the same policy to venereal cases.

SHOULD DISEASED CONDITIONS BE EXPLAINED?

When an applicant is examined for work and a diseased condition is found should he be told about it? This is a question that has caused considerable dispute among physicians in industry.

If we are working solely for the interests of the employer, and are willing to forget our responsibility toward society, then we may take the narrow view of this question. But, if we are making these examinations solely for the good of the old employees and the applicants themselves and if we are thorough and prove beyond a doubt that the conditions really exist, we need have no hesitancy in informing the individual of his trouble.

Some concerns forbid their physicians to ever tell an applicant when a diseased condition is present. The applicant is rejected by the employment manager and does not know that it is on account of health reasons. He may have a beginning pulmonary tuberculosis which has not yet forced him to seek medical advice. The doctor kills the professional instinct that urges him to warn this man of his danger. The employer rejects him for work. The man seeks employment elsewhere, exposing others to the disease and allowing it to progress as surely as a smouldering fire. He obtains employment in a dusty loft and finally is forced to quit work because of consumption. The disease is now incurable. Doesn't a considerable responsibility for his death lie at the door of that physician, and the concern who failed to warn him when the trouble was still curable?

Many applicants with kidney disease, a heart condition, or other incipient organic disease, of which they were not cognizant, will thank the doctor for telling them of the condition and will seek proper medical advice at once. But if they are not told they will go elsewhere and seek employment, usually where physical examinations are not required, and the work here will do the damage from which you saved them in your concern.

There can be but one answer to this question. Every applicant and every employee examined must be kindly and diplomatically told of his condition and given the advice that will enable him to seek the proper remedy. In order to be sure of his ground the physician may have to request the applicant to return for two or three re-examinations and careful laboratory tests. This should be done in every doubtful case until the diagnosis is made or the suspicious findings proved false. A concern whose doctors work thus carefully need never fear the consequences of telling an individual when a diseased condition is present.

DO APPLICANTS OBJECT TO EXAMINATIONS?

The fear of hampering their labor market was the chief objection to introducing this system into the plant of the first concern in Chicago that started it on a comprehensive scale. To their surprise, however, they found that applicants seldom objected. A radical labor journal made quite an attack upon the system but even this did not increase

objections. Frequently the remark was heard that "this must be a good place to work if the boss looks after the health of his employees this carefully."

The clean, comfortable doctor's office, the smiling nurses, the courteous, diplomatic way in which the doctors explained the purposes of the examination to each one, soon impressed the applicants that this practice was done for their good as well as for the good of the old employees and the employer. They told their friends about it and soon the labor supply for this industry was increased rather than limited. As one mother, who had brought her daughter here for a job, said: "I would rather my girl worked in a place like this, where she is protected from disease, for $5 a week than to mingle with people with no telling what's the matter with them, for $15 a week."

Out of 9000 applicants examined the first year there were six who refused the examination. In 1917 when jobs were plentiful there were forty refusals for examination out of 17000 applicants. Sixty others refused or failed to return for a re-examination when some condition was found that needed study.

The fact that so many concerns have adopted the physical examinations for applicants is sufficient proof that it does not limit the labor supply. This procedure must always be done from an unselfish standpoint, and governed by altruistic principles, however, or it will in time fall into disrepute.

FITTING DISABLED TO JOBS

The subject of fitting disabled men to proper work for which they are qualified would fill a volume in itself if the entire field of occupations were covered. But from a practical standpoint it involves just three things which must be considered by both the physician and the employment manager jointly. They are:

1. The nature of the man's disability.
2. His previous training and occupations.
3. The finding of the occupation in the industry for which the above qualifications fit him.

If the doctor pays no attention to the occupations to which handicapped men are assigned, or if the employment manager or foreman pay no attention to the remarks of the doctor concerning the man's physical condition, then no efficient system of fitting disabled to jobs is in vogue.

The actual selection, therefore, is a matter of considering each individual case in each industry. Every physician when dealing with the problem in its relation to his specific industry will shortly find

a number of positions where handicaps must not be employed. For instance:

Never put men who have been poisoned with lead, or other occupational poisons, back where the same hazard exists.

Never place men with organic heart disease in occupations where overexertion could make it worse; where a fainting spell could cause injury to them; or where they are responsible for the lives of others, as in engineering or elevator operating.

Keep the men with infected teeth, diseased tonsils and other predisposing rheumatic conditions out of dark, damp rooms; where exposed to extremes of heat and cold, and similar positions.

Keep the men with hernias off the heavy lifting jobs.

A long list of these prohibited jobs for men with handicaps should be prepared by the physician after a thorough study of his industry and should be given to the employment manager and every foreman in the plant with instructions from the head of the concern that these rules must be obeyed.

When a handicapped person has once been assigned to a job he should never be transferred to another occupation without the consent of the physician and the employment manager. To make sure that this rule is observed every transfer of men should be made only after conference with the employment department where each man's record is kept.

As a result of the return of so many war disabled to industry, England has had a commission studying this problem for the last two years. This commission has considered each occupation in the majority of industries in England, and has described the jobs which handicapped men can do, the training necessary to make them competent in this work, and what special appliances are necessary on the machines or on the men. These reports are set forth in several pamphlets which can be obtained from His Majesty's Stationery Office, London. They are entitled "Openings in Industry Suitable for Disabled Sailors and Soldiers."

WHAT BECOMES OF REJECTS?

The problem of what is to become of these men, who because of disabilities are refused work in industries, was becoming very acute before the war. With the increased demand for labor, the result of war production, almost everybody could get a job, including these diseased individuals who in normal times would have been rejected. It is impossible to estimate how many of these have sickened and died, how many accidents they have been responsible for, how much they have added to the labor turn-over situation, and to what extent they

have slowed up production. But as industry settles into its normal stride it is evident that the physical selection of men for work is an efficiency measure which is to be utilized more than ever. However, as the economic demand for man power increases even these handicapped individuals will be used, but they will be carefully assigned to work in which they can be efficient without adding to their disabilities.

Thus the country is learning its lesson. Undoubtedly these disabled men will be provided for in the future. These acts on the part of the government are necessary to meet this problem:

1. Provisions for proper medical treatment for all diseased and injured workmen—their physical reconstruction.

2. Provisions for proper vocational training in occupations which they can safely and efficiently perform in spite of their disabilities. Corporation schools, continuation schools, vestibule schools, and other vocational centers are already meeting this problem in some places.

3. Disability, insurance to provide for their maintenance and that of their families during these periods of treatment and training. Adequate insurance and proper care in case of permanent disability.

4. Repeal, by an executive order in case of disabled soldiers, or by state legislatures, of those portions of the various state compensation acts which now cause employers to discriminate against handicapped man.

During the present emergency our government is making these provisions for our disabled sailors and soldiers. A wise, far visioned Congress surely will provide these same advantages for the industrial army. Industry which is so essential to victory is disabling five times as many men and women as the war. What will we do with them?

PERCENTAGE OF REJECTS

Figures were obtained from eleven industries of the country representing many and varied occupations, whose medical staffs are reputed to make very thorough examinations and where all applicants are said to be examined.

The first five of these concerns are known to base their causes for rejection on these two points: first, whether the applicant has any condition that would make his presence dangerous to the old employees; second, whether he has any condition that would make work of any kind dangerous to himself. Their percentage of rejections vary from none to 3.9 per cent.

The remaining six concerns consider the above points in rejecting men plus the additional factor of the added compensation lia-

bility if they employ handicapped individuals. Their percentage of rejections vary from 9 per cent. to 16.76 per cent.

These percentages give a fairly accurate index of the number of industrial workers in the country who would need to take advantage of this opportunity for physical reconstruction and perhaps training for proper selected work.

As these examinations of applicants for work represent the approximate number of new men employed it is noteworthy that those concerns who have the lowest rejection rate as a rule have the lowest labor turn-over rate.

The attached table gives the percentages of both rejected and defective applicants as well as the nature of the business conducted by these concerns.

TABLE 10

Kind of industry	Number applicants examined in 1916	Per cent. having disabilities employed	Per cent. rejected because of disabilities	Total number of employees
Automobile factory	5,000	33.0	0.0	35,000
Garment industry	7,877		0.5	21,800
Mail order house	17,642	25.0	3.4	16,000
Gas company, includes shops, street gangs and office force	2,802	28.0	3.6	4,500
Grinding industry	(6 months) 2,618	98.0*	3.9	6,000
Engine and boiler foundry	4,475		9.0	6,500
Electrical manufacturing and munition plant	24,000	40.0	14.0	18,000
Rubber industry	33,000	64.9	14.1	14,000
Implement foundry	1,082	35.0	15.0	3,300
Electric power plant and city office force	3,645	5.0	15.0	5,100
Lamp foundry and electric company	2,756		16.76	

* Includes defective teeth.

CHAPTER XXVI

EXAMINATIONS AND CORRECTION OF EYE CONDITIONS

With the adoption of a thorough physical examination of employees and of all applicants for work it soon became apparent that a great number of the cases had faulty vision. At first the examining physicians would explain this defect to the workman, pointing out the lowered efficiency and the resulting handicap to his advancement due to lessened acuity of vision, and recommend that he consult a recognized eye specialist. Some followed the advice but the majority failed to do so because "they couldn't afford it," "didn't know where to go," "didn't want to lose time from work," or "could get just as good glasses at the department store or the corner drug store."

In order to meet this situation we arranged the following plan for the employees under our care:

1. All with vision below 20/25 should be referred to a competent eye specialist for examination and necessary correction.

2. Those needing glasses would be furnished the same at cost.

3. The doctor's fee and the cost of glasses would be paid for by the firm in every case, the employee repaying the firm in easy installments.

4. The eye specialist would charge a very nominal rate, and could afford to do so because of the bulk of work.

After adopting this plan it was comparatively easy to persuade employees with defective vision to take advantage of this opportunity of securing proper care.

Other concerns have had a similar experience and have met it in various ways. Practically all agree that some plan similar to the above is necessary to meet the great economic waste due to this common condition among employees—faulty vision.

Dr. Earle B. Fowler, who has been associated with the author in the night clinic on Industrial Medicine and Surgery, at Rush Medical College, and has had wide experience in this form of industrial practice has prepared the following brief:

"Primarily the examination of the eyes and correction of defects found has been taken up with the purpose of increasing efficiency. We have felt that the employer would benefit by selection; by the increase in accuracy and quantity of the work; and by justice in the

settlement of damage claims. The employee would, of course, be helped by the same factors; by a careful placing so that a defect does not mean a handicap; by increased wage earning ability and dependability; and by just recompense when injury causes disability.

"In the examinations of all applicants for acuity of vision a nurse or assistant can carry out the routine accurately. The distance must be definite and uniform; the test card evenly and brightly lighted with no direct light in the applicant's eye; the vision must be taken with each eye singly, using the utmost care in the covering of the unused eye; there must be two or three test cards to avoid memorizing in questionable cases. The covering completely of the unused eye without causing pressure on the globe has given the most difficulty, and it has been found that the palm of the patient's own hand (not the fingers), with the margin pressed closely against the nose gives the best results provided the applicant is forced to keep his head absolutely straight. (A black card may be used in the same manner.) This is easy to control and he must not be allowed to turn even slightly to right or left. Twenty feet is the arbitrary distance and in places where this cannot be obtained a mirror at ten feet (fourteen inch square plate) and reversed test type over the applicant's head is very satisfactory, in fact the advantage of being able to control the position of the head (keeping it straight) and at the same time to point to the letters, leads some to prefer this arrangement. The eyes must be at a uniform distance from the card (or mirror); sitting forward in the chair results in marked inaccuracy. The record is kept in terms noted on the margin of the test card opposite the line of smallest type read. A little urging will often demonstrate the vision to be better than indicated by the applicant's statement that he can read no farther, for many are nervous and feel hurried or have waited long and are tired.

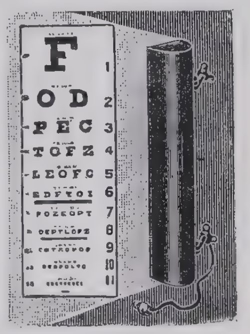

FIG. 53.—Snellen's vision test card.

"The requirements applied to this selective test must vary as judgment dictates. It has been found satisfactory to arbitrarily turn over to the surgeon all applicants *unable* to read the 8/10 (20/25) line with either eye alone and leave it to his judgment whether without correction they will get the best results in the work they are going into. The surgeon may carry out his work at the plant, making the complete examination and prescribing glasses when deemed necessary or the applicant may be referred to his office provided it is reasonably accessible. The problem of commercial supply of glasses may influence in the choice of arrangements, the object being to complete

the whole process with the least delay in starting the employee at work. If there is a reliable optician in the immediate neighborhood or one can be located at the plant during certain hours either plan for the surgeon's work will be satisfactory, otherwise time can be saved by the trip to the office as there will have to be a day spent in going for the glasses anyway. It is most important that the frames be fitted individually with care and accuracy. As we are caring for people of small salaries it is hard to require an employee or applicant for work to spend the amount necessary for glasses, and in the attitude of the patient toward this we meet one of our hardest problems. Some firms arrange to buy the glasses and charge the amount against the employee for repayment in installments. Ordering uniformly from one concern will often materially reduce the price. From the point of view of the surgeon the use of mydriatics, necessary in at least a percentage of the cases, would require much time if working at the plant and if there are too many cases referred time can be saved by sandwiching these in at the office. Most of these problems work themselves out and the method most advantageous to all is reached in time.

"Another group of referred cases is made up of those employees reporting disability from headache, or eye fatigue. In most instances a general physical examination is made including nose and throat and then they are referred for the correction or elimination of visual defects. In a large proportion of these the vision at 20 feet is normal or better but varying degrees of hyperopia or hyperopic astigmatism are responsible for the symptoms. Muscle balance is carefully examined in all of these. Added to this group are the employees, most often from the correspondence or clerical departments, typists or comptometer operators, reported for repeated errors. Though not a large number the results obtained with this class have been most important.

"Cases of injury and inflammation will be discussed later.

"The question of visual requirements after correction with glasses must be left to the judgment of the surgeon. Definite abnormalities must be emphasized in the record so as to be noted in case of transfer from one class of work to another. Poor distant vision does not handicap for close work if the near vision is good, but would be a menace for one doing truck driving. Great reduction in the one eye, a condition very frequently met with, would lead to a designation as "unsafe" for elevator operator or similar occupation while not interfering in another line. Some familiarity with the work in all departments is a necessary part of the surgeon's training if he is to make these decisions with the best results for all concerned.

"During the first year of this eye work at Sears, Roebuck & Company, eye tests were carefully made and the record of vision kept, but

it was left to the judgment and choice of the employee whether to follow the advice given regarding proper correction. As a result out of 2000 cases of defective vision found among the applicants and old employees only 327 placed themselves under proper treatment.

"The second year, April 1, 1916 to April 1, 1917, there were 1834 referred of 20,507 applicants, otherwise acceptable, and in the first eight months of the third year, April 1 to January 1, 1918, 1028 cases were referred.

"A brief summary of these cases gives some idea of the need for this work. The results are based on the examination of 2652 employees, during a period of one year and eight months, referred because of defective vision or symptoms of eye strain. The records total as follows:

1. Both eyes less than ½ vision.......................... 763
   Of these 289 were improved to normal, 307 to better than ½, with a prospect of further improvement as glasses were worn, and 12 were not improved.
2. One eye less than ½ vision.......................... 662
   Of these 225 were improved to normal; 318 improved, but not to normal; 119 not improved. In most instances recorded "not improved" the other eye was normal and either the prospects of improvements even with glasses were not good, or it was felt the patient would not wear glasses even if supplied. As the one good eye was sufficient for all requirements of work the wearing of glasses could not be forced. This most important group will be referred to in the last part of the chapter in reference to damage suits.
3. Headaches and eye strain 764
   Of these 493 had normal vision, 271 with reduced vision are included in the above.

"Although detailed records of cases and results at the time of fitting have been kept the above is sufficient here. The hardest statistical work comes in the follow up. In the opinion of department managers there has been a distinct value to the work. In all instances they have accepted our decisions in regard to placing or transferring employees. The results of this selection must be speculative; conclusions in regard to those in which vision was bettered must also be judged by opinions of work improvement. Those in charge give many instances of marked increase in quantity and quality of the work of these employees either as groups or individuals. It is comparatively easy to judge of those reporting for eye strain or headaches. These results have been most gratifying as marked improvement or complete relief is very definite. The loss of time is reduced at once to a minimum.

"Just how much the employer or the employee profits by this branch of the work covered in this report we cannot measure, but we feel sure it is sufficient to more than balance time and money spent. Reports from other firms confirm this in so far as results can be judged from observation purely.

"Since the employees' compensation laws have gone into effect it has become important for all concerned that an accurate account of vision of every employee be kept. In the group above in which the vision in one eye was less than 1/2 normal 60 per cent. were unaware of the fact until the routine test brought this out. Without a record the possibility of an unfair settlement following a very slight or imagined injury in any of these cases is evident.

"This year a young man applied for a position. Three months previous he had passed the vision test for the navy. When he came to us a low grade neuritis had reduced vision to 0 right eye, left eye 6/10. How easily it would have been to convince a jury that a blow on the head two weeks after going to work caused blindness. Good vision, a blow on the head, proven blindness; our peers do not require that pathology be presented.

"Fortunately the accidents are few. We try to look after all foreign body cases and injuries immediately and follow up the treatment until the condition is healed. Of course it is optional with the patient whether he accepts treatment from the surgeon employed by the company or goes immediately to his own. Our only insistence here being that he sees someone we know to be thoroughly reliable.

"If we only take and record vision carefully we have done something toward bettering our judgment of an employee's capabilities, also we have shown him his deficiences. We do more if we urge or demand a correction of these deficiencies, and still more if we help in the securing of the correction."

CHAPTER XXVII

MEDICAL TREATMENT OF EMPLOYEES

The amount of medical treatment afforded sick and injured employees in concerns having medical staffs varies considerably. Most of these take complete charge of the treatment of all injured employees when accidents are directly the result of occupations or plant conditions. Likewise if a disease results from occupation they will assume the medical care.

Some refer all sick employees to their family physicians, refusing even first aid treatment. Others render treatment in certain diseased conditions referring all other cases to their family physicians, but maintaining some form of supervision over the treatment given these employees. Still other concerns furnish complete medical and surgical care to all.

In the majority of cases most plant surgeons have been conscientiously referring the sick employees to their family physician. As a rule they receive excellent care. But in a number of instances these cases are neglected, their time loss from work is greatly increased, and there is a very decided financial loss to both the employee and employer.

More and more the physician in industrial practice is being called upon to assume the entire medical care of the employees. These physicians feel a professional obligation toward their fellow practitioners and usually are very conscientious in meeting this obligation. Nevertheless, they are often placed in an embarrassing position because of their other obligation to both employer and employed.

The physician responsible for the human maintenance department in an industry must be absolutely honest and fearless. *Professional ethics in its truest form must be his guide.* But the old false standard of ethics, which prevents a physician from interfering in another doctor's case when he sees the patient is being neglected, or which prevents him from giving an honest opinion to a patient in order to protect another physician's dishonesty, should not be confused with true professional ethics.

SUPERVISION OF MEDICAL TREATMENT

The advance which has been made from the days when the company surgeon paid no attention to the medical diseases of the employees

to the present systems of supervision of their medical treatment marks one of the most progressive movements in industrial medicine. Its influence presages almost revolutionary changes in the practice of medicine.

In the well organized medical departments of industry no employee can remain away from work on account of sickness without the doctor's knowledge. This knowledge is obtained through these channels:

1. An employee becoming sick at work must secure a pass from the doctor's office before going home. He is then reported on sick leave every morning, by his foreman, until he returns when he must obtain a pass back to work from the doctor.

2. Every employee who cannot come to work, must send word to his foreman the morning of his first day of absence. Those who are home on account of sickness are reported to the doctor's office. In the case of an employee who fails to notify the foreman there are many ways of ascertaining the causes of absence. After twenty-four hours, if no word has been received, the foreman should send a trusted employee to investigate.

When an employee is home on account of sickness, the visiting nurse calls on him within the first three days of his absence and as frequently thereafter as his condition indicates.

It is her duty to learn the nature of the sickness by talking with the family physician and the family. She must make sure that the doctor is on the job and that every possible care is being given the employee. These nurses even render such nursing aid as bathing the patient and preparing certain foods (thus teaching the wife or another), cleaning up the room and changing the linen on the bed. This is always done with the consent of the family physician.

These nurses soon develop a keen perception regarding the seriousness of the case and the kind of treatment the patient is receiving. When, in her judgment, the case is not progressing properly or there is evidence of neglect she reports the same to the chief surgeon.

Some member of the medical staff then phones the family physician and arranges to visit the employee in consultation or alone. Any suggestions, such as the employment, by the industry, of a nurse for the patient, or the sending of the employee to a hospital, or the need of special consultation, or special treatment, are then made to the family physician. This is done diplomatically, with the knowledge that the concern will pay, or loan the needed money to the family, for this additional care. As a rule, the family physician welcomes this interest in his patient. Only seldom is it necessary to tell the family that the case is being neglected and offer the services of the medical staff.

The following examples illustrate this method of supervision:

Mr. J. was reported absent on account of sickness by his foreman. The next day the nurse called at his home and found that he was very sick but had not yet summoned his family physician. The nurse secured his wife's consent and asked this doctor to call. The following day the nurse again visited the patient and learned that he had pneumonia. The sick room was badly ventilated and dirty. The wife had four small children and no help, and could give very little attention to her sick husband. The doctor had only called once and was not to return unless requested. The patient's condition seemed very serious, so the nurse reported the state of affairs to the chief surgeon.

One of the medical staff, after arranging with the family physician, met the latter at the patient's home within a few hours. As a result of this consultation, the patient was removed into an airy front room, a nurse was put on the case, the industry paying the cost, and in ten days the man had passed his crisis. With the care this man was receiving, and would have received in the days prior to such supervision, the chances are he would have died. He was a valuable employee, was receiving two-thirds of his wages while away from work, and in case of death, would have received a death benefit from the benefit association. It is evident that from an economic standpoint this was good business on the part of this concern.

Example 2.—Jennie J. came to the doctor's office on account of a severe pain in her right side. Examination revealed marked tenderness over the appendix region. The blood count showed 16,000 leukocytes. A diagnosis of acute appendicitis was made. The family physician was called on the phone and asked if he wished the case sent direct to some hospital. He preferred to have her sent home, and promised to call there very shortly. A taxi cab, therefore, was ordered, and Jennie was sent home with a card giving the result of our laboratory examination and the diagnosis.

A nurse called the next day and reported back that Jennie seemed better, and that her doctor had laughed at our diagnosis as she was suffering only from gastritis. The attitude of the family was hostile as they felt we had made a serious mistake. The following day the nurse reported that Jennie was much worse. The family doctor had sent some other medicine out to the house, but the family did not think it necessary to have him call.

When the nurse called the next day she found Jennie suffering great pain, and the abdomen hard and distended. She reported over the phone to the chief surgeon that the patient was being woefully neglected, and would die unless some active steps were taken at once.

The chief surgeon phoned the family physician and explained the situation to him. The latter still contended that it was only a case of gastritis. He acknowledged that he had made no further blood-

count. He refused to meet the surgeon in consultation, and stated positively that we had no right to interfere with his patient. A request to call on Jennie was then made direct to the family. As she was receiving benefits from the association they could not very well refuse.

The examination made by the company surgeon at this time showed a large appendiceal abscess had developed. The blood-count was 24,000 leukocytes. The condition was carefully explained to the family, and finally their consent gained for an operation. The fact that the surgeon would operate free of charge, and that only the hospital expenses need be met by them, influenced their decision. While the girl was being sent to the hospital the father got in touch with the family physician. Just before the operation this doctor appeared on the scene and strenuously objected. Consultation was called and agreed that it was an extreme case and immediate operation was necessary. The father then consented.

At the operation a large appendiceal abscess was found filling most of the right side. Thorough drainage resulted in recovery after some six weeks. A year later it was necessary to operate on this girl a second time and remove a gangrenous appendix which could not be found in the presence of the large amount of pus at the first operation.

The neglect of this case resulted in an avoidable operation and eleven weeks of unnecessary lost time from work. This is not an unusual example, for every medical staff which is properly supervising the treatment of their employees has had similar experiences. No physician believing in true professional ethics, which must react to the welfare of both the patient and the doctor, would condemn this form of interference in a case receiving such neglectful treatment.

The number of different forms of quackery which the medical staff of a large industry meets is appalling. Some of these practices are carried on by known quacks and others by presumably reputable physicians.

If the plant doctors are honestly supervising the treatment, they must meet these various forms of quackery with outspoken condemnation and must use every argument to have the patient seek proper medical care.

A sharp distinction must be drawn between quackery and certain legitimate forms of treatment which may not exactly agree with the views of the medical staff. In the latter case the physician should never belittle the work of the family doctor nor make any disparaging remarks about his diagnosis and form of treatment in the presence of his patient. The profession soon learns to know if the medical staff of an industry is at all times square in its judgment and statements

to their patients and the degree of respect and co-operation given by the physicians in a community is influenced accordingly. This is important as no system of treatment supervision can be adequate where co-operation with the family physicians does not exist.

The following are examples of pure or near quackery which the physician in industry is daily called upon to meet and correct.

1. The Venereal Quack.—The methods of these so-called specialists for men's diseases are notorious. The extent to which their perfidious practices reach out and rob the working classes of our country surely is not known, otherwise a government interested in the welfare and protection of its people would long ago have eradicated this nuisance against society.

Cases of so-called gonorrhea have been found at examinations of employees, who have been under the care of these quacks for months, paying a dollar per treatment and receiving the same nightly from a lay assistant. Bacteriological examinations of the discharge failed to reveal gonococci. Careful inquiry revealed the fact that injections of strong solutions of silver nitrate, or of nitric acid had developed a marked urethritis thus keeping up the discharge.

Many legitimate cases of gonorrhea are treated by these specialists and "cured" in two weeks for $25 paid in advance. The cure consists of a drying up process. When the recurrence appears they can be "cured" again for $20 paid in advance. Often these men are convinced that the recurrence is a new infection and must therefore pay the usual rate of $25.

Men who fear they have been exposed to syphilis, or have contracted the disease go to these quacks. Heavy doses of potassium iodid are administered until the typical iodid rash appears and then it is easy to convince the patient that he has the disease. Many cases have been reclaimed from the treachery of these robbers and have been relieved of the terror created in their minds, by the "museum" maintained by these quacks and the line of talk handed out by them.

Employees with harmless varicoceles often consult these specialists and are led to believe that the condition is serious. Electrical treatments, expensive "imported" lotions and even more expensive trusses or suspensories are sold to them.

The efficiency of employees, hounded by the fears created by quacks, and worry over the debts the treatments involve, is bound to be affected. The economic loss to industry from this source cannot be estimated.

2. Patent Medicine Quackery.—This is a more insidious form of quackery and often very difficult to cope with. An employee begins to lose weight and feels badly. He reads an advertisement

describing symptoms that correspond to his, or the corner druggist suggests that "swampy-root" or "S.S." or some other patent medicine is just what he needs. Secure in the belief that this medicine will cure him he takes a vacation to rest up and get in shape again. In spite of the four bottles of the medicine he has consumed he grows worse and finally returns to the city and consults the physician at the plant. Examination shows an advanced tuberculosis. If he had consulted a doctor in the beginning instead of an "ad," or a druggist, the disease could have been discovered in its incipiency and cured. As it is the cure is now accomplished only after a great loss of time from work, or oftener he may not be cured at all.

Such patent medicines, frequently containing a high percentage of potassium iodid, have been known to break down tubercles and cause a rapid spread of the disease.

Many examples of the misplaced trust of patients in patent medicines, and even in drugs prescribed by physicians, are constantly brought to the attention of the medical staff of an industry. This leads up to the third type of quack.

3. The Non-examining, Non-diagnosing Type of Physician who prescribes drugs without knowing whether they are indicated or not. Many highly respected family physicians would be shocked to be placed in this category of "quacks." Yet is is hard to distinguish between some of their practices and those of qualified quacks.

When an employee reports that he has been home for the last month on account of stomach trouble, taking three kinds of medicine from Dr. J., his family physician; when on careful inquiry you find that this doctor has never examined the patient; and, when your examination reveals a pulmonary tuberculosis as the true condition, it is only human to condemn such a hit and miss method of prescribing drugs.

One of the commonest examples of this type of quackery is the giving of medicine to a patient for "kidney trouble." The physician at the plant examines the urine but finds no sign of kidney disease. On inquiry he learns that the family physician has never even secured a specimen of the patient's urine.

Frequently an employee reports to the office with a severe attack of appendicitis. He gives a history of having had a severe pain in his abdomen the night before. He went to his family doctor and was given some powders to relieve the pain and was ordered to take a dose of salts. No, the doctor did not examine him. When this physician is called on the phone and told that his patient has an acute appendix, he often replies, "Well I was afraid that was the trouble last night." I never hesitate to frankly tell such a doctor that his neglect to examine the case, and the drugs which he prescribed, jeopardized his patient's life. Neither do I hesitate to take this

patient away from his doctor and either refer him to some competent surgeon, or, if he is not able to pay for proper service, to perform the operation myself free of charge.

The examples of this blind treatment of disease without a thorough examination and diagnosis are so frequently brought to the attention of the surgeon who is supervising the health of employees, that too much emphasis cannot be laid upon this treacherous and dishonest practice. Whenever such a case presents itself it is the duty of the plant surgeon to tell both the employee and his physician that examinations are essential to the proper treatment of disease. This frankness has been known to influence some family physicians to improve their standards.

Every teacher of medicine should impress his students with this great need of proper diagnosis of every case before prescribing drugs. A state law providing for the thorough examination of every sick person by a physician before drugs are prescribed and further providing that no kind of drugs can be dispensed except on the prescription of a physician, would be one of the greatest measures for the conservation of man-power which could be adopted. It would at once do away with "counter prescribing" by druggists, with the sale of patent medicines, and would eliminate the doctor who sits at his desk and hands out prescriptions or medicines with barely a glance at his patient.

To-day with so many physicians in the army it behooves the government to take adequate steps to prevent the increase of quackery and of patent medicine sales which is bound to flourish because of the scarcity of competent medical men. This should be a war measure for health conservation.

4. Hernia Quacks.—In many cities there are so-called specialists who cure hernias by a bloodless operation. The men who patronize such quacks are most often met among employees in our industries. This operation as a rule consists of the injection of paraffin into the inguinal canal. I have later operated on a number of such cases. This form of treatment of hernia is a failure and a waste of the employee's money and every man with hernia should be warned against this method.

5. Belts, supports, braces, plates and other appliances make up another form of quackery which is frequently perpetrated on workmen as well as others. Too often after abdominal operations expensive belts are sold to these people who can ill afford this additional expense. Experience in hundreds of cases of abdominal operations has proven that only in exceptional instances are these belts needed. When used they tend to make the patients over-cautious about exercising or exerting themselves, and frequently prolong the length of dis-

ability. I have found a belt necessary in only two out of three hundred cases of herniotomy.

The majority of surgeons would undoubtedly scorn accepting a commission for belts sold their patients, yet we all know that the prescribing of these post-operative belts is too often done for the 25 per cent. commission paid the surgeon or the hospital, instead of offering real service to the patient.

The need for braces and supports should be carefully determined before a physician prescribes these expensive appliances. In a few cases employees have applied to the Employees Service department for a loan in order to buy some such appliance. The case is examined thoroughly by the plant physician and then the question of the need for this brace is taken up with the employee's doctor. Several times this has resulted in a saving to the employee of $40 or more for the appliance. Plates for flat-feet are often sold to people without any effort being made to correct the faulty type of shoes worn. Often these plates are bought on the suggestion of some shoe salesman or of a druggist. In too many cases this is a needless expense as the type of plate bought does not correct the trouble.

The useless expenditure of money by employees for these various appliances is one of the commonest conditions which the medical staff encounters. Electric belts, electric pads for the shoes, porous plasters, flannel jackets, chamois vests and innumerable other contraptions come in this category of appliance quackery.

A large mail order house, which installed this comprehensive system of health supervision of employees, including condemnation of all forms of quackery and of patent medicines, gives an excellent example of a concern "practicing what it preaches." The writer was told to go over their drug catalogue and cross off every patent medicine and every appliance which they were selling which could in any way be detrimental, or of no value, to the buyer. As a result this concern deliberately ceased to sell patent medicines thereby cutting off profits amounting to $180,000 a year. It retained for sale only those drugs commonly used as household remedies such as castor oil, Epsom salts, soda bicarbonate, etc.

If all manufacturers and retailers of the obnoxious types of patent medicines would voluntarily adopt such a principle the effect on the health of the nation would be incalculable. In the absence of voluntary action some legal action should be taken.

The medical staff which is responsible for the supervision of the medical treatment of employees must in every case, first, determine if the best possible treatment is being given; second, if all adjuncts which will help hasten the patient's recovery are being used and if not, see that the concern provides these when the family cannot afford to do

so; third, if interference in the treatment of the case is necessary; fourth, advise the employees against the wrong line of treatment, against quacks the use of patent medicines and all other forms of quackery; and fifth, use every means of educating the employees to a knowledge of what constitutes proper medical treatment. The employee who once learns this will demand more scientific care from his physician.

WHAT CASES SHOULD BE TREATED?

Granting that the medical staff of an industry is to refer all cases of sickness that rightfully belong to the family physician, then what cases should this staff treat?

The real purpose of an industry in establishing an expensive medical system is to reduce the amount of sickness and injuries among its employees, and to reduce the amount of lost time from work to a minimum when these do occur. It is purely a business proposition with them. However, due largely to the influence of their physicians, they recognize the claims of the family physician and the rights of employees to choose their own doctor.

But in many cases better results are obtained and there is less financial loss to the concern if they take complete charge of the treatment. Again they feel that their responsibility toward the working force and society in general has a greater claim on them than the rights of any individual physician and for this reason they assume the care of certain types of cases. In other instances they demand that employees undergo certain forms of treatment in order to improve their health and make them more efficient, and therefore it is the employer's duty to see that proper treatment is rendered them.

As the medical staffs, by their work, have demonstrated the value of proper treatment in these various types of cases, it is only natural for the management to demand that this treatment be given. This is not written in defense of the practice but rather to show the profession at large why it is done.

1. Treatment is given by the company surgeons to all injured employees when their work is responsible for the injury. The surgeon, trained in emergency surgery, and responsible to the management for results, as a rule gives more active treatment, gets the employee back on the job quicker, and strives to return him with the best possible restoration of function. The cost of this surgical care is less to the concern than if these cases went to outside surgeons. It has proven a good business proposition to the industry.

A great number of employees are injured at home. Many would neglect the injury if compelled to pay a doctor's fee for the dressing of what seems to them a trivial wound. These cases can be treated

in the doctor's office and complications with loss of time from work avoided in many instances.

2. Employees with certain diseased conditions are dangerous to the rest of the working force. The tuberculous, the syphilitics, and those with acute contagious diseases are examples.

Some concerns seek out these tuberculous employees and forbid them working in the plant. It would be an injustice to these sick employees, and to society at large, if they were discharged outright. Therefore these concerns have assumed the responsibility of giving such cases proper sanitorium care, paying all their expenses, and often providing an allowance to the family during the absence of the wage earner. No better safeguard to the public health of a community can be conceived, and certainly no family physician should object to the treatment of these cases.

Most employers discharge all active venereal cases on the ground of protecting the old force. One or two concerns have adopted the same policy in these cases as for tuberculosis, and are providing proper treatment for them, while at the same time steps are taken to protect others from infection. Careful treatment combined with proper selected work, hastens their recovery and prevents complications. This is a direct financial gain to the employer whereas the old plan meant undue loss of time or expensive labor turn-over.

Close co-operation between the municipal health departments and the medical staff in the case of acute contagious diseases has resulted in better control and better care for these.

3. Employees with bad teeth, diseased tonsils, uncorrected defective vision and many other conditions are often inefficient workers because of the undermining of their health. When these are found the medical staff offers to take care of them free of charge, or provides for their care by some specialist employed for the purpose. Often money is loaned to employees to pay for this service and the company dentist or the doctors arrange for some specialist in the community to give the necessary treatment at a stipulated fee, usually less than would ordinarily be charged. The correction of these conditions is good business on the part of the industry, and better results demand that the medical staff take charge or supervise this treatment.

4. In a large industry many employees will be found with conditions which are being neglected because of lack of funds to provide proper treatment. Many of these concerns have arrangements with hospitals whereby cheaper hospital care can be obtained. Such cases are therefore sent to these hospitals and operated free of charge by the company surgeon rather than sending them to the city or county hospitals for free treatment.

5. The types of medical cases requiring treatment which predomi-

nate are the minor ailments which develop while at work. The employee, after being examined and ruling out a more serious condition, can often be relieved by prescribing some medicine and a few hours rest in the rest rooms provided for this purpose. Others must be sent home. Whenever medicine is prescribed for cases going home a statement as to the drug used should be sent with the patient for the family physician.

6. In certain industries there are specific diseases the direct result of the occupations, as for example lead poisoning, occupational dermatitis and furunculosis. These are treated by the company physicians the same as all accident cases, or at least should be.

The treatment of these six different groups of cases combined with proper supervision over the treatment afforded by the family physicians make up the bulk of the remedial work which the medical staffs of most industries carry on.

COMPLETE MEDICAL TREATMENT

For many years we have had examples of the medical staffs of certain industries rendering all medical care to employees and to their families. This practice has chiefly been in vogue in the mining and lumbering companies of the west. It is also a common practice in northern Michigan. Practically all of these plans involved the payment of from $1 to $5 a year, by the employee, into the medical fund. This assured him free treatment for a year. It also included free treatment for the family with the exception of certain operations and obstetrical cases for which a small additional charge was usually made.

This type of practice in many instances was excellent. The best qualified surgeons took the positions and developed an efficient staff of assistants. Unfortunately in too many places the doctor tried to increase his income by cutting down on the number of assistants. It was impossible for him to render the most efficient, scientific treatment to the great number of people depending on him. A very mediocre form of medicine was practised. This lowered the reputation of this form of contract work.

Fortunately some of these concerns have awakened to the value of the best preventive measures combined with the best treatment. They have provided excellent hospital facilities and have very competent staffs. In such places the treatment afforded to the employees and their families is of the best. The old type of contract practice, which is condemned by all, is being eradicated by this new era of industrial medicine.

The Brooklyn Rapid Transit Company affords an example of a concern that has adopted all the modern principles of industrial

medicine and surgery and has extended it to include free medical care for its employees. They claim that practically 95 per cent. of their people use their medical staff altogether and that time loss on account of sickness has been reduced to a large extent. Above all, they assert that these measures introduced for the welfare of their working force have paid the greatest dividends in increased loyalty on the part of employees. As an example of loyalty the men of this concern were the only ones who refused to walk out during the street railway strike in Greater New York a few years ago.

TYPES OF CASES CAUSING TIME LOSS

The diseases which cause loss of time from work, and therefore need medical treatment, will vary considerably. In a plant where no health supervision has been conducted many more cases of chronic disease will be found. For instance tuberculosis made up from 1.5 per cent. to 2 per cent. of the total causes for lost time, whereas after several years of careful supervision this disease only accounted for 0.3 per cent. of the causes, in the author's experience. The reduction of lost time on account of heart disease after health supervision, proper selection of work, and adequate treatment is provided for such employees, is a striking example of the benefits of this work.

The minor ailments which cause loss of time are the most difficult to control. Nevertheless in these cases improvement in sanitary conditions, plenty of recreation for the employees, good water supply and the training of employees to drink plenty of water, educating them to correct their diet and depend upon food rather than cathartics to keep their bowels active, and steps to prevent fatigue, have all caused a reduction in loss of time.

In a working force of twelve thousand, divided approximately into five thousand girls and seven thousand men the annual time loss on account of sickness was estimated at six days per employee. There were fifteen thousand two hundred and forty-four cases of lost time from work among girls and six thousand four hundred and twenty cases of lost time among the men.

The ailments which caused this lost time can be classed as minor and serious. The minor ailments were often undiagnosed, as the employees simply remained at home and on their return gave some indefinite symptom or homely diagnosis which they had made themselves. These common, everyday bad feelings which you and I have, and for which a doctor is seldom consulted come under this group. The attached table is of interest as it shows the diseases in a large industry most responsible for time loss.

TABLE 11.

DISEASES CAUSING TIME LOSS

Number of Employees

Male	7,000
Female	5,000
Total	12,000

Cases of Lost Time

Male	6,420
Female	15,244
Total	21,664

Minor conditions	Female	Per cent.	Male	Per cent.
1. Headache	3778	24.0	1255	19.00
2. Dysmenorrhea	2935	18.9		
3. Colds	2251	14.0	1313	20.40
4. "Grippe"	1354	08.0	956	14.80
5. Tonsillitis	974	06.0	883	13.70
6. Nausea	750	04.8	203	03.10
7. Other stomach conditions	403	02.6	331	05.00
8. Nervousness	355	02.3	42	00.60
9. Neuralgias, myalgias and pains in joints	188	01.3	123	01.90
10. Backache	153	01.0	111	01.80
11. Stiff neck	99	00.6	30	00.40
12. Eye conditions	172	01.2	56	00.87
13. Ear conditions	102	00.6	36	00.50
14. Fever	110	00.7	107	01.80
15. Diarrhea	130	00.8	74	01.10
16. Constipation	92	00.6	41	00.60
17. Fainting	132	00.8	13	00.20

Serious conditions	Female	Per cent.	Male	Per cent.
18. Appendicitis	48	0.300	35	0.50
19. Bronchitis	27	0.180	45	0.60
20. Heart trouble	8	0.050	2	0.03
21. Kidney disease	4	0.020	4	0.06
22. Pleurisy	9	0.060	24	0.40
23. Pneumonia	2	0.010	12	0.20
24. Paralysis	1	0.007	1	0.01
25. Rheumatism	90	0.600	122	1.74
26. Anemic and generally run down	34	0.200	4	0.06
27. Acute contagious diseases	32	0.200	32	0.50
28. Typhoid fever	1	0.007	1	0.01
29. Tuberculosis	19	0.140	15	0.23
30. Miscellaneous	1281	8.400	505	7.80

An industry with its large group of employees forms a great human laboratory—a veritable physician's paradise. Here he can study all varieties of pathological conditions, every type of preventive measures, and the best lines of treatment which will afford the quickest and surest results. He also gains an insight into those social and economic conditions which are constantly playing a greater part in all medical work.

CHAPTER XXVIII

WOMEN IN INDUSTRY

THEIR EMPLOYMENT, SUPERVISION OF THEIR HEALTH, AND OTHER PROBLEMS

The fact that a separate chapter is devoted to the problems related to women employees does not indicate that a different standard of health supervision must be established for them. All that has been written in other chapters relative to industrial hygiene, physical examinations, treatment of disease and accidents—in fact, the entire field of industrial medicine, is applicable to women as well as men employees. Their employment in industry, however, presents a few problems which must receive special consideration.

The present world war has focused public attention on the question of woman's work as nothing else has ever done. In the pre-war days the women were employed in rather limited fields, every industry having certain positions which were recognized by men as rightfully belonging to them. Whenever an employer endeavored to place women on work carried on by the male employees labor troubles usually ensued. A few women were able to overcome these prejudices and enter a broader field of endeavor, but the majority continued to work on jobs suitable to their weaker strength and paying a wage far below that earned by the men.

Many labor leaders to-day still contend that it is not necessary to extend the scope of woman's work, that the proper mobilization of man-power in this country would result in keeping production at a maximum. Nevertheless, as our millions of men are being absorbed by the army we see women taking up the work of these men and in most instances carrying on with equal, or even greater efficiency.

England, France, Canada and other nations, have been forced to utilize women on occupations heretofore thought of only in connection with men. It is only logical to foresee that our country must do the same.

In every nation the slogan "equal pay for equal work" has been adopted by the industries, and many of the old injustices toward women employees are being corrected. Exploitation of women in industry is becoming a thing of the past. This is truly a "War for Democracy:"

In many of our well organized industries, for years previous to the

war, the women employees have been enjoying comforts and conveniences, every means for the protection of their health have been provided, and a good living wage has been paid to all. But in many other concerns, the most deplorable conditions existed and still exist. Let us make a comparison.

The writer once worked in two different factories where great numbers of women were employed. One was a shoe factory, the other a glass factory. In both these the girls worked in the same rooms with the men. No effort was made to supervise the relationship between the sexes. Vile stories and obscene jokes were bandied back and forth, the foreman often taking the lead in these pastimes. Proper toilet facilities were unknown. Privies, one for men and one for women, but in close proximity, were in use and were filthy and unsanitary. I recall that the pits were so unprotected that a drunken man fell into one of these one night and was found dead the next morning.

There were practically no washing facilities. Everybody, girls included, carried their lunches and ate them in the working places. When a girl became sick at work she usually had to stop for the day and go home, often walking a considerable distance. There was a cot in the corner where the girls kept their wraps, which could be used for resting purposes, but a rest room as we understand it to-day was unknown.

One of these factories operating day and night employed a force of girls for the night shift also. The use of suction fans or other means of removing the injurious dusts was unheard of.

Only the poor girls who had to work could have endured such conditions. And the wages they received for ten hours' work were far below those paid the men. It was such standards as these that caused the girl who must work to lose caste. Humane employers who improved the working places for our girls and protected them against those influences which undermined their moral and physical well-being were great benefactors to the race. Some ranks in society still retain their early impressions of the girl who must work.

For men to work is honorable. Work is just as honorable for women. And to-day all classes of women, from the poor who must work to the rich who work for patriotic reasons, are entering all kinds of industrial occupations. New standards are being set and a new viewpoint is being obtained by society concerning woman's work.

Compare with the conditions in the two factories described above the conditions in factories in England to-day. We are told that modern factories have been built in England to produce many of the essentials for war, and that if these factories were joined together they would make a building twenty-five miles long and forty feet in width.

Women make up a large proportion of their working forces. Partly to induce women to work, and partly because they found that such things helped production, these factories are equipped with everything which will add to the comfort, convenience and health of the employees.

Men and women work in the closest proximity. But in each department there is an intelligent forelady whose character and personality is such that she is a constant stimulus for good. The moral standards in these industries are of the highest. Women are honored and respected just as much, although they must often dress in trousers in order to do men's work.

FIG. 54.—Every industrial sanitary measure has been provided in these new working homes in England.

The sanitary conditions of these plants have been perfected to the highest degree possible. Every method for the protection of the employees, both male and female, against the dangerous poisons found in munition work and all other occupational diseases have been provided. Every modern washing and toilet facility has been installed. Restaurants and canteens are a definite part of the organization.

Comfort rooms where the girls can lie down and rest when necessary, and where they can go to relax during the noon hour and rest periods is now recognized as one of the most important provisions in the working place. Arrangements have been made for suitable homes for all employees, and when girls must room, the management has

supervised the selection of these rooming places. Many concerns have provided dormitories for their girls.

Suitable recreation for the employees is now a definite part of all programs seeking to improve the conditions of the working force. The communities have entered into this angle of war work and provide all kinds of entertainments for the girls similar to our entertainments for the soldier boys.

The question of hours of labor has been settled in England because it was essential to find the best solution of this problem in terms of maximum production. That country found the greatest output ob-

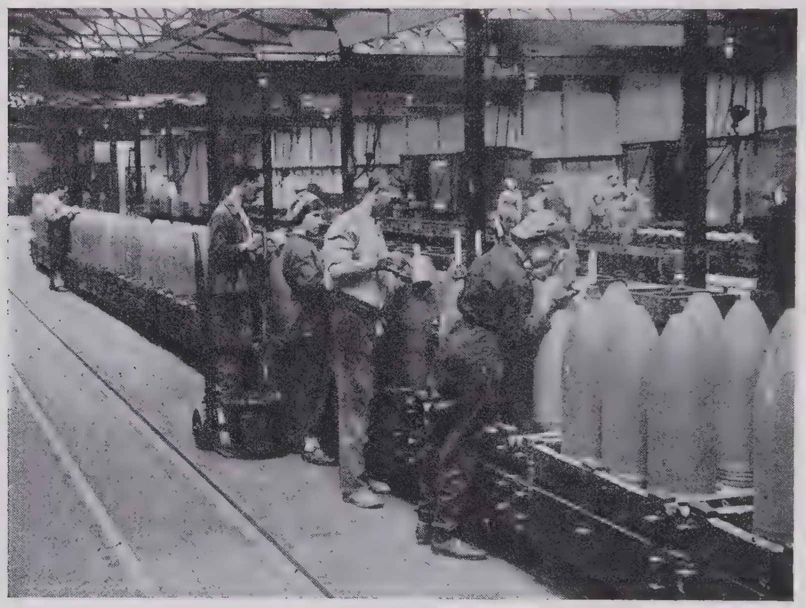

Fig. 55.—A good forelady makes segregation of men and women employees unnecessary.

tained when the standard of eight hour shifts was adopted. This has even been divided so that employees work two hours, rest fifteen minutes; work two hours, thirty minutes for lunch; work two hours, fifteen minutes rest; work one hour and quit. Not only is such a standard good for girls but it produces the best results when applied to men.

England was not always thus kindly toward her women employees. The same deplorable exploitation of women workers existed there as has existed in this country. But the need for greater production for war purposes, and the presence of many women who demanded better conditions, forced both employers and the government to adopt those measures which both Industrial Medicine and Industrial Engineering have been urging for years.

England will never go back to the old conditions. To-day the women in America who are so gallantly taking their places in the industrial army are unconsciously forcing many changes in our working conditions. Social and economic improvements are being advanced fifty, yes, a hundred years under the stress of war. America will never go back to the old conditions.

Many individuals, committees, organizations, and government agencies have been concentrating their studies and efforts on this problem of "women in industry" since our country entered the war. The reports of all these bodies should be bound and given to every employer throughout the land and if he is wise he would read them as faithfully as he should read his bible. If he has a keen business sense he would learn his lesson. Every physician in industrial practice should likewise become familiar with these reports if he desires to keep up with the rapid advancements which are taking place these days. Two of the most valuable contributions on this subject are, "Women in Industry" by Mr. C. E. Knoeffel, which can be obtained from the Society of Industrial Engineers; and "War-time Employment of Women in the Metal Trades" published by the National Industrial Conference Board, 15 Beacon Street, Boston, Massachusetts.

That the industries of America will meet this problem of employment of women as thoroughly as England has done is indicated by the following report of a committee on Standards appointed by the Standard Practice Executive's Club of Detroit, Michigan, which represents forty different concerns:

"In order to protect the women who may enter industry at our solicitation and to provide for them fair working conditions, the Committee on Standards of Working Conditions submits the following recommendation:

"1. That the Recruiting Committee investigate the applications from married women with children to ascertain if the children are properly cared for. Results of investigations to be filed with the Central Bureau.

"2. That women be given equal pay for equal work. While learning they shall be paid the flat day rate paid men for the same work or operation. This recommendation has the endorsement of the Detroit Division of the Women's Committee of the Council of National Defense, as they passed a resolution to this effect on May 14, 1917. The committee understands that the Buick Motor Car Company, of Flint, Michigan, is at present paying women on this basis.

"3. Because of the experience of England, where it was found that shorter hours resulted in more and better work, we suggest that the working day for women be limited to eight hours and that the maximum weekly hours be limited to forty-eight.

"4. That the following working conditions are essential:

"(*a*) Separate entrances to be provided for women if practicable; if not, that women be allowed to report for work fifteen minutes later than men and leave fifteen minutes earlier.

"(*b*) That separate workshops be provided if possible; if not, that there be both a man and woman supervisor stationed in the mixed departments.

"(*c*) That rest rooms and toilets adjoining workshops be provided with a matron in charge.

"(*d*) That a sufficient number of drinking fountains be installed in each department.

"(*e*) That the period for lunch be at least forty-five minutes.

"(*f*) That if possible a restaurant be operated on the premises; if not, at least a counter maintained where a box lunch with hot coffee and tea and milk can be purchased at cost.

"(*g*) That provision be made for rest periods during working hours, their frequency and duration depending on the nature of the work.

"(*h*) That seats be provided wherever possible to avoid injury to women by standing all day at their work.

"(*i*) That sickness insurance be provided to care for workers absent because of sickness.

"(*j*) That workers on monotonous and tedious operations, to avoid undue fatigue, be transferred from time to time as seems advisable.

"(*k*) That there shall be provision for first aid attention to all workers.

"(*l*) That there be first class supervision of working conditions with particular reference to safety, sanitation, ventilation and lighting.

"(*m*) That some person be delegated to act as welfare supervisor for the plant, to whom women shall have access and whose duty it shall be to have general oversight over welfare conditions. This position might be given to some woman already in the employ of the company, in addition to her other duties, but if possible a trained person should be secured for this work.

"In setting up these standards the committee feels that its work would be useless and ineffective unless a permanent committee was appointed by the executives to investigate working conditions in each plant employing women to be recruited by the special committee organized for the purpose. Such a committee should not only make an investigation before placing the women, but should further make periodic visits to ascertain if the standards are being maintained according to agreement. Since it is almost impossible to set standards for first aid and safety provisions, without an intimate knowledge of the size and kind of plant and hazard of the work, we deem it advisable that this permanent inspection committee treat each plant individually

adjusting requirements in each case according to the conditions found on visitation.

"It is further believed that a physical examination should be made of each applicant."

Every physician familiar with the occupational hazards to health that exist in industries realizes that the methods of prevention of many occupational diseases have not yet been perfected. Most of these diseases have been studied from their effect on men. With women entering these new fields new problems will undoubtedly be presented. Lead poisoning is known to be more injurious to women than to men. Will not the same be found true of other occupational poisonings? Industrial accidents have been more common among the male employees but this is due to the more hazardous occupations they have been engaged in. With women entering these new jobs the accident rate is bound to increase. The fact that they are "green" at the work will be an etiological factor in increased injuries. Is it not possible that complications following these injuries will be more serious and more prevalent?

These and many other problems will follow the employment of women in men's work. While the management and the lay forces are preparing to increase the comforts and conveniences and otherwise improve working conditions so that women can be employed, the medical staffs of these industries must become more rigid in their efforts to supervise the health of these workers. The doctor must carefully study the effect of every new occupation upon women workers and determine as soon as possible what jobs they are fitted for and what jobs they must be absolutely barred from.

The future of the race depends upon these women. No war emergency must allow the wastage of our woman-power else defeat will ultimately be ours. A new responsibility rests upon the physician in industry because of the increased activities of the women workers.

Women have always been employed in many occupations where medical supervision was indicated but where it did not exist. The small employer has used his women on work entirely too arduous for them. The heavy farm work which many women used to perform has been responsible for thousands of premature deaths. What workers needed more careful supervision, or provisions for their comfort and welfare, than the hard working scrub women slaving every night, in wet and filth, in our large office buildings in the cities? Very little attention has been paid to their home conditions, to the hours of labor which they must work. Every medical dispensary has known this prematurely old woman, broken in health, but very few doctors have sought the source of her trouble in her occupation.

So, during this first year of war, we have witnessed women enter-

ing many positions where medical supervision is unknown. Conductors on street cars, elevator operators with long, closely confined hours, janitor work, railway section hands, loading of junk, coal, coke and other material on flat cars, piling of lumber, firing stationary boilers, working in machine shops, and shoe stores, in cellar and lofts, these are some of the new occupations which these pioneer women workers in men's jobs have entered.

Fig. 56.—Women have replaced men in many occupations in the munition factories.

Can they stand the work; what are its hazards for them; what of the factor of fatigue and other conditions which will predispose to sickness? How are we to answer these problems without the most careful medical supervision?

The time has arrived when our federal government must demand the most thorough supervision of the health of all workers—men and women. After one year of war the nation has learned that this great industrial army is just as essential to the winning of the war as our military army. The men and women in this second line of defense must be medically supervised, furnished with the adequate medical

and surgical care when necessary, and otherwise conserved the same as the first line of defense.

In those industries where medical departments are maintained they should not be disrupted by the demand for physicians in the army. But such industrial clinics should be extended and made a center for medical supervision of all workers in that neighborhood.

For those industries where no medical supervision has been in vogue and for the employees in small concerns, and on the isolated jobs, there must be established industrial clinics in every community where employees must be forced to report for proper supervision. Other physicians must be placed in the field as inspectors to supervise the working conditions. All the recognized essential features of industrial medicine must be summoned for the protection of this industrial army, and especially for the protection cf the women who are braving these unknown dangers to help win the war.

A federal plan of public health service is the only solution of these and the other health problems confronting our civil population to-day. With the medical forces of the nation so depleted by the demands of the army provisions must be made to utilize to the greatest advantage the remaining civilian physicians. The prevention of disease and accidents among the industrial employees of the country and their families will reduce the amount of curative medicine which must be practised. The medical forces of the country must be mobilized therefore and a certain percentage of the physicians must be ordered to duty in the industrial army. Prevention must become the slogan of the medical profession.

Choosing Occupations for Women

Already women workers have upset our preconceived ideas of what jobs they are capable of holding. Throwing off the hampering influences of sex and inexperience woman has stepped forth into the fields of work hitherto belonging only to the realm of man. From every source testimony is coming that she is making good. But this new freedom must be controlled. She must not be allowed to enter work which in time will destroy her or mean a premature breakdown.

Therefore every woman worker should receive a careful physical examination and the occupation should then be chosen according to her physical qualifications. In every case the question of whether she is physically and mentally fit to do the work and whether the occupation will be unduly hazardous for her must be answered.

Some have suggested that a survey should at once be made of all positions available for women and then a board should decide which of these jobs she could enter and from which she must be debarred. This board might lay down some general principles on this subject

but the real selection of proper occupations can only be made by considering each individual case as she presents herself. Some women will be found perfectly able to enter occupations requiring heavy lifting or constant standing, while others must be assigned to sedentary work only.

The Physical Examination

How thoroughly should this examination be made? There is no question but that women should be examined from head to foot, the same as men are examined; a complete analysis cannot be made in any other way. But to do this women physicians must be employed and the number of these is not sufficient to meet the demand.

One large industry employed two women physicians and subjected every girl employee to a complete examination. For three years they kept careful records of these examinations. The number of pathological conditions discovered by this thorough system were only slightly more than those found by the partial examinations in other concerns. They have since discarded the method as it was very distasteful to their girl employees.

The conditions usually found in healthy males by examining below the waist are hernia; venereal disease; hydrocele, varicocele and undescended testicle; varicosities, deformities of the extremities; flat-feet and other foot conditions. Remember most employees examined are apparently healthy and the examination is not made for the purpose of discovering some acute disease.

The proportion of these conditions found by examining women below the waist are small compared with men. Hernia is rare in women—even the femoral type which is the commonest form found in this sex.

Dr. Schereschewsky states that he found one hernia in five hundred examinations of female garment workers. In two thousand examinations of girl employees, where the history of the case indicated a more thorough examination, the author found three femoral and one inguinal hernia. In five hundred consecutive examinations in a gynecological dispensary the author found only five femoral or inguinal hernias whereas umbilical and ventral hernia were common. These were chiefly found in older women who had borne children. Therefore the need of examining female employees for hernia is not sufficient to warrant subjecting them to the naked examination.

Questioning as to whether they have a lump or swelling in the groin will usually be answered in the affirmative by a woman employee if a hernia does exist.

Venereal disease is often hard to detect in women. I have been told by the physician in charge of the work in the concern referred

to above that the percentage of venereal cases found by their complete examinations were very few. In our clinic we have discovered cases of syphilis among the girl employees but this was done by the detection of mucous patches in the throat or the rash on the body.

Varicose veins are common among older women or among the married women who apply for work. These do not object to the physician examining their extremities. But the average girl employee has been protected from the type of occupations which have made varicosities more prevalent among the male workers.

Flat-feet and other foot deformities can often be detected by the gait of the employee. As girls have been employed on sedentary occupations, sitting most of the time, it has not been so important to examine their feet. But in our clinic questions have been asked concerning foot troubles and when indicated they have been examined.

Because of the rarity of conditions found below the waist line, influencing woman's fitness for work, most physicians in industry have limited their examinations to the head, neck and chest coupled with a careful history in each case which develops the need for a more complete examination in certain cases.

This partial examination can be made by a male physician, *always*, however, in the presence of a nurse. In order to make sure that a nurse was always present and to safeguard the physician in case some employee raised a disagreeable question, Dr. A. M. Harvey initiated the plan of having the nurse initial every examination record in the presence of the woman just examined.

For years the author had no woman physician on his staff in a plant where approximately 5000 girls were employed and were frequently examined. There was seldom an objection raised to one of the male physicians examining a girl. All abdominal examinations were made by either the chief of staff or his first assistant. Girls needing this more thorough examination were referred to the chief nurse who explained how and why it was made and then prepared the girl. She covered the girl's body with a sheet and the doctor was then called into the room. He was very careful not to unduly expose the girl, examining by moving the sheet slightly to one side. No girl was ever unnecessarily embarrassed and she usually explained to her friends how considerate the doctor had been.

Vaginal examinations were never made except when the history or symptoms indicated the need. In married women these were done as described for abdominal examinations. In the case of single girls they were told by the chief nurse of the need and were asked to bring their mother next day, or a note giving her consent, when the chief surgeon would make the regional examination. Usually if a girl had never been examined vaginally she reported with her mother

or a close friend to the hospital in the city where the surgeon made the examination under a light gas anesthetic. This facilitated the examination and relieved the girl of the embarrassment.

New physicians, fresh from hospital or dispensary practices, entering this field for the first time will often make the mistake of handling these cases as so much material for study. They will order a girl to submit to a regional examination as though she was a dispensary patient (a practice which should likewise be condemned). They are even careless about unduly exposing her.

Such methods will always place the doctor in a wrong light before these employees and will soon destroy the usefulness of the doctor's office. In fact such methods should not be tolerated in a dispensary. My first advice to every new assistant is, "handle every case as though a hundred dollar fee was at stake."

When a lady physician was finally employed on my staff she had considerable difficulty in gaining the girls' confidence. Often they insisted on one of the male physicians making the examination. However, this doctor because of her skill and her wonderful personality won a place for herself in the hearts of all the girls, which makes her services invaluable now. Whenever a competent, diplomatic woman physician can be employed for the examination of girl employees the same should be done. The professional standards should never be lowered, however, just to employ a woman doctor and certainly never in the case of your male physician. Men or women who have not sufficient training to make a good income at the practice of medicine should never be employed in industry just because they can be obtained at a cheap salary.

The routine examination of girl employees should be done as follows:

1. Secure careful history by the nurse. Only the positive points need be recorded.

2. Nurse takes temperature, pulse, weight and height and tests the vision by Snellen method. Records these findings on the card.

3. Girl is then taken to lavatory (best if next to dressing room) and a specimen of urine is obtained. This is placed in a compartment basket with other specimens, duly marked, and carried to the laboratory for analysis.

4. Girl removes waist and under vest and is covered with a cape made from a sheet.

5. She then goes into the adjoining room, where the doctor and nurse remain constantly, and is examined. As there is no undue exposure of these girls two can be waiting while the doctor is examining one; a sheet suspended between the waiting girls and the one being examined will add to the privacy.

The cape worn by these girls (see Fig. 57) has a large neck opening and can be pulled down over either breast for the purposes of examination, the other breast remaining covered. Either side of the back can be similarly examined. The sides of the chest can be examined through the side openings of the cape. This permits of examining the entire chest as far as the waist line without exposing any large area at one time. The nurse who is present moves the cape for the doctor.

This examination consists of (*a*) reading nurse's findings on the history card and also urinalysis; (*b*) examining eyes, nose, teeth, tonsils

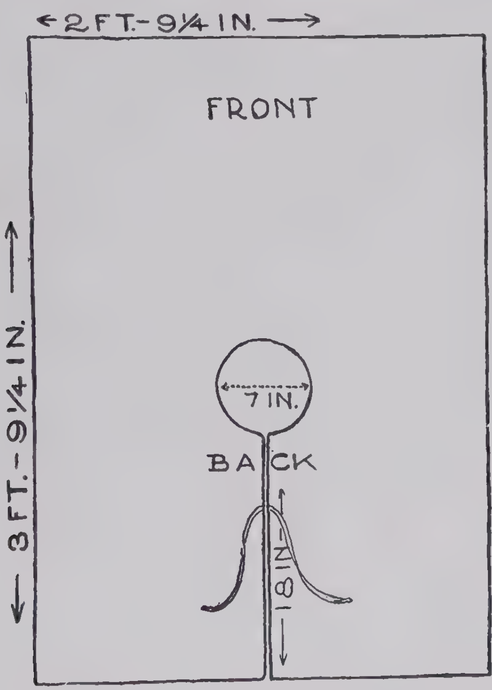

Fig. 57.—Illustrating type of cape used to cover chest of girls during physical examination.

and pharynx; (*c*) palpating glands of neck and thyroid; (*d*) examining heart by auscultation (palpation, percussion and blood-pressure are only done when some indication is found); (*e*) percussing lungs and then examining by auscultation; (*f*) recording all findings on history card.

While examining the lungs and heart both breasts can be inspected for suspicious swellings and the girl questioned about these. When indicated the breasts should be thoroughly palpated—usually through the thin cape. While the nurse is standing over the girl she can carefully inspect the hair and if signs of pediculosis are present

she will then thoroughly examine the employee. Many cases of pediculosis have been discovered by this method.

The doctor asks questions regarding abdominal and extremity conditions. If in the examination, history or the urinalysis show the need of a more complete examination she is referred to the chief nurse. In questionable cases the chief of staff is called into the examining room at once for consultation.

Many girls have an anemic appearance and these should always be referred to the laboratory for a blood count. Those with bad teeth are referred to the dentist. Defective vision cases are sent to the eye specialist and proper glasses fitted or other corrections made.

Fig. 58.—Examining a girl applicant for work. Note how cape covers the chest, also that nurse is present.

In the routine examination room all that is needed is a stool for the doctor, a piano stool for the girl being examined (this facilitates her turning around quickly), a chair for the nurse, and a table by the side of the doctor for his instruments, and for writing purposes. All necessary appliances should be arranged close at hand for the doctor, namely his stethoscope, wooden tongue depressors, which are used only once, the nasal speculum and the blood-pressure outfit.

Many of these girls are found with conditions which need careful study, or further examination. They are told to report for re-examinations and the time and type of examination needed is recorded on their cards. The record room keeps a tickler system on all such cases and makes sure that they report. This same plan is used for the men.

When drugs are necessary to relieve symptoms or conditions a note to this effect is made on the history cards and the nurse sees that these girls are sent to the drug room where a nurse gives the medicine needed. Prescribing of drugs has been reduced to a minimum.

Which Girl Employees are Examined?

All girl applicants for work should be examined for the same reasons set forth in the chapter on examination of applicants for work, namely, proper physical selection for the work and protection of old force from contagious diseases. The type of work the employment department intends to employ the girl on should always be shown on her history card so that the doctor can size up her physical qualifications with this work in mind. Girls who later are to be transferred to an altogether different occupation should be re-examined.

Girls taken sick while at work should come to the doctor's office for a pass home. Their case should then be carefully analyzed and when indicated an examination should be made. Likewise, many girls will report to the office sick who can be later returned to work by a few hours rest in the rest room. Many of these must be examined.

On returning to work after an illness employees must report to the office for a pass back to work. Those whose history indicates the need should be examined. In a large industry this plan may cause much lost time from work due to the congestion in the doctor's office from so many reporting, and the long distance between the office and some departments. To obviate this loss a number of substations have been provided in various parts of the plant with a nurse in charge.

The employees, especially the girls, can report to these for their passes. Most of the girls have been absent one or two days on account of some minor ailment and these can be sent direct to work by the nurse. Others the nurse will send to the doctor's office for examination before the pass is issued.

All women employed in fatiguing occupations or hazardous work from the standpoint of occupational poisonings, should be periodically examined. This is one of the most important features of proper health supervision.

Rest Rooms

Wherever women are employed clean, airy rest rooms removed from excessive noises should be provided. They should be furnished with single beds, instead of hard cots, with clean pillow and sheets and warm blankets. A nurse or some qualified matron should always be in charge. Screens should separate the beds so as to furnish privacy to each girl. Talking and other noises should be prohibited. The room should be kept cool and well ventilated. Its very appearance should be restful.

In the author's early experience the rest room was a dark back room of the doctor's office. Hard cots, provided only with a blanket under and over the girl, afforded the means for rest. When a sick girl reported to the office and the nurse suggested that she lie down in

the rest room instead of going home she refused oftener than accepted the invitation. It was only an emergency room used by the girls when too sick to refuse.

Later this concern provided a large, airy room furnished with beds as described above. The girls with temporary sickness would report to the office and were always glad to go to the rest room, remove only their shoes, or perhaps loosen their skirts and corsets and crawl in between the clean sheets and under the warm blankets. The nurse would then bring them a hot water bottle and often a hot drink. Many were given a glass of malted milk or a cup of hot tea. After an hour or so these girls would feel better and would return to work (Fig. 59).

Fig. 59.—Rest room for women employees. Nurse always in charge. (*From Doctor's Office, Sears, Roebuck & Co.*)

In the old days girls who had fainted, had severe cramps with their periods, had headaches, nausea, diarrhea, pain in their side, or other minor ailment, usually went home losing the greater portion of the day and often longer because the exertion of going home had made the condition worse. With this new rest room these girls were restored to work in a short time, and often more serious conditions were aborted.

No greater efficiency measure can be installed by a concern than a properly located, adequately equipped rest room.

Sitting Positions and Rest Periods

Most state laws now require that women shall be furnished seats while at work. None of these laws seemed to take into account the deleterious effect of this constant sitting. Our good law makers seemed to think they had met their obligations toward those of the gentler sex, who must work, by gallantly providing them seats.

Constant standing is undoubtedly fatiguing to most women workers,

but of the two evils constant sitting is the worse. The congestion of the pelvic organs by this practice, and the tendency toward constipation because of lack of exercise, causes many pathological conditions to develop in the generative organs of women. The congestion and constipation also tend to develop hemorrhoids. Backaches, pains in the legs and many ill-feelings can be traced to constant sitting.

The ideal work for woman will enable her to stand part time and sit part time. If she can move about while at work it is even better. In the departments where the work permits this I have found at least 50 per cent. less absenteeism on account of dysmenorrhea than in those departments where the girls sat constantly at their work. Fainting, nervousness and signs of fatigue were also less.

Even before state laws demanded it, many occupations for girls necessitated constant sitting. For these, and in fact for all workers, rest periods should be provided. Ten or fifteen minutes in the middle of the morning, and the same time in the middle of the afternoon furnish these workers the opportunity to walk about, relax from the tension of work, do their visiting and gossiping and get rid of the stored up products of fatigue.

The windows of the working room should be opened up during such a period, and marching, calisthenics, games and other forms of exercise indulged in. Music at these periods from a victrola will stimulate dancing, and that in itself is restful. The forelady should devise means to make these rest periods of the greatest benefit to the girls.

Clothing

The new occupations women are entering are having a marked influence on their manner of dress. Overalls and trousers are common wearing apparel for many women workers to-day. Common sense, thick soled low heeled shoes are necessary in many of these positions. If this influence will extend to her sisters in the ordinary occupations of woman great benefits and increased efficiency will result.

The constant sitting regulations were largely necessary because of the illogical shoes girls wear when working. It is obvious that the high Cuban or French heel, with the thin turned sole, or the low pumps, were never made to work in, especially if the work require standing.

If women can be persuaded to wear shoes modelled after those recommended for soldiers they will develop strong feet and will be able to qualify for many more positions than have been opened to them in industry in the past.

The high heeled shoe, loose skirts, flowing sleeves and other peculiarities of dress are hazardous in occupations about machinery, tending to increase the accident rate.

In departments where men and girls work together great difficulties in ventilation are presented during the winter months, because of the flimsy waists worn by girls. They are easily chilled when a window is opened and demand more heat than is wholesome in the departments.

One of the best services the nurses or the woman advisor or welfare worker can render to a concern is to correct these faulty dress habits among the girl employees.

Food

Every employee should get out of the working room for the lunch hour, during which time it should be thoroughly aired out. This is especially applicable where girls in sedentary occupations are employed.

A cafeteria or restaurant should be provided where warm, wholesome food can be obtained. If the number of employees does not warrant this then some suitable place for the eating of lunches should be provided. Here hot tea or coffee or soup should be sold at a small price.

Drinking and Toilet Facilities

Every recommendation for improving the hygienic conditions of the working place made in other chapters should be adopted wherever girls are employed. Special mention is made here of the drinking and toilet facilities because there is a tendency to neglect their importance.

When employees are engaged on piece work, and especially in the case of girls, one often finds that insufficient water is consumed and the requirements of nature are neglected. The girls will simply not lose the money involved by taking time off for these things.

The only solution for this is that the employer will give ample time, without loss to the employee, to attend to these essentials. Bubbling fountains should be located near the working places and every employee should be thoroughly educated in the importance of water drinking. No better remedy is at hand for the prevention of fatigue than frequent flushings of the body organs by water.

For every hundred girl employees there should be provided close at hand at least five toilets. The toilet rooms should be kept clean and well ventilated. Washing facilities should be in the room, or an adjoining room. Receptacles for refuse are necessary. Means for obtaining sanitary napkins should always be present in these rooms.

Minor Diseases Common to Women Employees

From an analysis of 15,244 cases of absence on account of sickness (see Chapter XXVII) the author found that **headaches** caused 24 per

cent. of the absenteeism. Headaches are more common among girls than men and cause a great loss to every concern employing girls. The plant doctor should make a careful study of every case to ascertain the cause. The condition is usually indicative of some other trouble, the correction of which will stop this drain on efficiency.

Constipation is present in many cases and the cessation of headaches on curing this condition is a common result. Diseased tonsils, defective teeth, and other foci of infection about the nose and throat, as well as defective vision, are frequently the source of headaches- These should be carefully examined, the teeth even being x-rayed and any infected foci removed. Glasses should be provided whenever needed. The author has operated free of charge over one hundred cases of infected tonsils in order to relieve employees of headaches and thus improve their value to the concern. Over a thousand cases of defective teeth have been corrected for the same purpose and has resulted in at least 50 per cent. of the cases being relieved.

Fatigue poisoning, faulty diet especially at the lunch hour, insufficient water drinking, night work at home and many other conditions either in their work, in their living conditions or in their bodies, have been found as the cause of headaches. The physician will find that in a large percentage of the cases he can run the cause to earth by diligently studying all possible sources. The value of this work to the employer cannot be estimated, but must result in great financial saving in labor turn-over and great gains in output.

Dysmenorrhea came second in the causes for absences, 18.9 per cent. This condition as a cause for reducing efficiency and making irregular attendance at work has not received sufficient attention from the medical profession. The subject is dealt with in detail further on in this chapter.

Rest periods, with relief from constant sitting, the urging of plenty of outdoor exercise, the relieving of constipation by proper diet, and a suitable rest room for a few hours rest when the period starts, have all resulted in a decrease in this cause of absence. Here again the doctor's ingenuity will be tested in finding the cause of the trouble.

Colds ranked third, or 14 per cent., in the causes of absence. This condition was 20.4 per cent. of the causes among men. It is a very difficult condition to control and is undoubtedly infectious. Associated with it are mild forms of tonsillitis and other respiratory infections. It is much better to send employees with colds home than to leave them in the department to spread the disease. But employees with mild "colds" will not report to the doctor's office remaining in the department as sources of infection to others.

Educational propaganda on the infectious nature of "colds," "grippe," and tonsillitis will help reduce this source of absenteeism.

The following "Don'ts" should be spread by letters, pamphlets, bulletin boards and other means throughout the working force:

1. Colds, grippe, tonsillitis and often causes of coughs are infectious and you can spread these to your fellow workers.

2. *Don't* continue to work when you have these but report to the doctor at once.

3. Don't talk, sneeze, or cough into another person's face especially when you have a cold.

4. Don't jerk your handkerchief from your pocket and carelessly shake it before or after using.

5. Don't sneeze or cough without covering your mouth with a handkerchief.

6. Don't spit on the floor.

7. Don't use a common towel, drinking cup, utensils or anything that might be the means of spreading your cold to others.

8. Don't put pencils, pens, envelopes or like things in your mouth. If you haven't a cold maybe the other fellow had.

9. Don't fail to report to the doctor early. Colds can often be stopped by proper early treatment.

All employees reporting to the office on account of these respiratory conditions must be scrutinized thoroughly to discover if he has this contagious type. The temperature will often be 99^{6}° to 100° while the employee insists "outside of a bad cold I am well and able to work." Those with temperature should always be sent home. The throat which is inflamed, often covered with very small pearly papules, is suggestive of this so-called grippe. A severe headache and aching all over associated with a slight sore throat or a "cold" is sufficient evidence to warrant sending the employee home to protect the old force.

Often painting the nose and throat with a 10 per cent. solution of argyrol or using an alkaline spray and repeating it several times during the day, with hot drinks, combined with a few hours rest in the rest room, the bed being isolated and thoroughly cleaned afterward, will serve to abort these "colds." When an employee, who is hardly sick enough to call his or her doctor, is sent home instructions such as the following should be given:

1. Go home and rest.

2. Take a hot bath and a hot lemonade.

3. Take a dose of salts or castor oil.

4. Go to bed and cover up warmly.

5. Gargle a solution of one teaspoonful of baking soda (Soda Bicarbonate) to a glass of water every two hours.

6. Drink plenty of water; also drink a hot lemonade every 2 hours containing the following:

Baking soda	1 oz.
Cream of tartar	1 teaspoonful
Sugar	½ oz.
Lemon juice	1 oz.
Hot water	1 pint

7. If the cold has disappeared after twenty-four hours you can report to the doctor's office—otherwise you should summon your family physician.

Many a serious illness with prolonged disability has been aborted by these methods. The plant physician should ever be on his guard against these epidemics of "colds" or so-called "grippe" which have frequently disrupted the working forces in many industries.

Grippe and **tonsillitis** made up 8 per cent. and 6 per cent. of the causes for disability among the girls and 14.8 per cent. and 13.7 per cent. of the causes among the men. Thus "colds" and these two conditions rank higher in the causes for absence than any other minor ailments.

Stomach trouble, nausea and cramps, and pain in the side cause considerable of the lost time from work. Girls will get up in the morning and because they "don't feel like it" or because they are late will rush off to work without eating. About the middle of the morning they become weak, sick at their stomach and are forced to report to the doctor's office. Many of these can be relieved and sent back to work. Often a little food or a glass of malted milk is the best treatment you can render.

These stomach conditions, fainting, and nervousness are the commonest manifestations of fatigue. When a girl reports three or four times with these conditions a careful investigation of her working conditions will usually reveal the cause.

Constipation.—Constipation is one of the commonest complaints among girl employees and undoubtedly plays a very important part in the minor illnesses which cause short periods of lost time from work. In over a thousand consecutive records of working girls, approximately 33 per cent. give a history of constipation and at least 20 per cent. of these were more or less habitually constipated.

The cathartic habit among girls is more extensive than would generally be believed. This is especially true among the foreign element and the less educated, and is undoubtedly stimulated by the extensive advertisements of various kinds of laxatives in foreign and cheaper newspapers.

Girl employees are more prone to use the doctor's office than are the men and one of the most frequent causes for their visits is constipation. The easiest way for the doctor to handle these cases is to give them a Seidlitz powder or a pill but such a method will only

serve to increase the trouble. For several years I have met this problem by giving every employee who complains of constipation, a printed diet sheet containing anticonstipation foods which could readily be purchased at the restaurant, could be carried in the lunch basket, and which could be served at home. In addition each case was given a prescription for a fruit mixture as follows:

Figs	¼ lb.
Dates	¼ lb.
Seedless raisins	¼ lb.
Cooked prunes	¼ lb.
Senna leaves	½ oz.

Grind through a meat chopper or chop up finely, mold into a loaf and keep in a cool place. Take one or two teaspoonfuls every night.

In one department employing twenty girls, I found that 70 per cent. of these suffered from constipation and approximately 50 per cent. had dysmenorrhea. Efforts to overcome these two conditions were concentrated on this group. The forelady secured a table in a restaurant where they could all eat together and insisted on the manager of the restaurant serving the girls with at least two of the articles mentioned in the constipation diet list. She also saw that the girls made up the fruit mixture and used it. In addition, they were stimulated to take plenty of exercise outside of working hours. Within one month the constipation was completely overcome in every case, and within three months the ten girls who had been accustomed to report to the rest room for their sick time or to remain away from their work for a day, ceased this practice.

Proper diet, sufficient exercise and considerable educational propaganda a ainst the habit of taking cathartics will decrease the amount of constipation among all employees to a marked extent. Such efforts are of the greatest economic value to the industry.

Dysmenorrhea.—Among concerns employing great numbers of girls, this condition of painful menstruation causes an incalculable loss of time from work and decreased efficiency before and after as well as during the periods.

The causes of this condition are many. A small percentage are due to anatomical displacements or some pathological change in the generative organs. The majority of the cases, however, are traceable to other conditions more or less remote from the pelvis. Of these, constipation, and the conditions predisposing to this, such as improper food, lack of exercise, etc., is the commonest cause. A few years ago, many state legislatures endeavored to improve health conditions among working girls by enacting laws making it necessary for them to sit while at work. In my opinion constant sitting during the long

working hours is as bad, if not worse, than constant standing. This sitting posture causes more or less congestion of the pelvic organs which is increased by constipation so often associated with constant sitting. If girls could be persuaded to dress properly and then could be gradually trained to standing and walking for several hours, much healthier employment could be found for them than the sedentary occupations to which they are now condemned, chiefly by legislature. Under the existing conditions, occupations which allow part time sitting and part time standing, or if this is impossible, frequent rest periods which will allow the girls to stand and move about, will be found of the greatest benefit in overcoming dysmenorrhea.

The next commonest cause for this condition can be found in an unstable, nervous mechanism. A large percentage of the girls who reported to the doctor's office because of painful menstrual periods also reported at other times because of various nervous manifestations, such as fainting, hysteria, "nervousness" and many neurasthenic symptoms. I have submitted hundreds of these girls to thorough physical examinations (not including vaginal) and many of these have shown the signs of neurocirculatory asthenia, the long narrow chest with the acute intercostal angle (Stiller type), movable or even floating kidneys especially of the right side, and exaggerated abdominal reflexes. These cases are so common that the nurse who was present at the time of examinations voluntarily remarked about the similarity of the findings. Many girls suffer from neurasthenic symptoms during their periods which are based upon the teaching or on the lack of teaching of the mother. Instead of being told of this normal condition in their sex, they are suddenly frightened to death by its appearance. They are then told to keep quiet, avoid excitement, never bathe and similar instructions all of which stimulates fear of consequences and tends to develop the neurasthenic state at each subsequent period. It is imperative that our girls be taught that this is a normal condition and should not be regarded as a "sick time."

I have submitted girls to vaginal and rectal examinations, usually under gas anesthesia, whose dysmenorrhea could not be accounted for by the above conditions or cured by the correction of the same. Only about 10 per cent. of these cases showed definite pathologic changes which could account for the dysmenorrhea. Of these, an acute retroflexion of the uterus was the commonest finding, marked retroversion being the next commonest condition. In many of these cases the rectum was found impacted with fecal matter even when constipation was not complained of. Care of the bowels and proper exercises, such as assuming the knee chest position for several minutes, three times a day, relieved many of these while in a few an operation was necessary. The operative cases gave uniformly good results

chiefly because such radical treatment was not instituted until all other sources of the trouble had been eliminated except, perhaps, some due to neurasthenia.

The number of girls suffering from dysmenorrhea in the working force can be greatly reduced by systematic efforts directed toward this end by the medical staff. Here the nurse and intelligent foreladies can be of greatest assistance, in fact they must often take the lead in directing the routine measures suggested by the doctor. The first essential is to decrease the number of cases of constipation to a minimum. Directions for this are given above. Next, every industry employing girls should provide the means for healthful recreation including games which afford plenty of outdoor exercise. Lectures will be found of great value, but better than this is a careful study of each case of dysmenorrhea followed by individual instructions concerning the methods of overcoming it. The nurses can give these instructions by many intimate talks with the girls. Hot drinks, especially those containing certain food values, combined with a short rest in the rest room, will enable many to return shortly to work whereas medicine given to relieve the pain only tends to create a habit.

This short résumé concerning this, one of the most important problems in industry, is given with a view of stimulating more concerted action on the part of both physicians and nurses in industry in order to overcome a condition which has hitherto been tolerated. In correcting dysmenorrhea, many of the faulty conditions surrounding women in industry will likewise be corrected.

CHAPTER XXIX

THE TUBERCULOUS EMPLOYEE

Tuberculosis has been a greater enemy of the human race than almost any other disease. Its devastation has surpassed the wanton destruction of savages.

The pulmonary type is the commonest form of tuberculosis, but it also involves glands, bones and joints, the serous linings of cavities, as the pleura, peritoneum, and meninges, and attacks other organs of the body as the kidney or the testicle.

In dealing with the problem of the tuberculous employee the pulmonary type only will be considered, but the principles herein set forth are applicable to practically all forms of this disease.

Tuberculosis is not a disease of industrial life alone. It existed even more extensively among the American Indians and other aborigines, where our modern industrial conditions were unknown. The more favored in life, from the standpoint of wealth and social position, have succumbed to its ravages. Among the agricultural class, where outdoor life and abundance of food prevail, the disease has been very common. But unquestionably it has caused the greatest destruction among the poor working classes in our industrial centers.

In all nations as the tendency to concentrate in certain communities increased, and as small shops grew into factories, and these into great congested industries, the working people were more and more crowded together. Small homes were replaced with flats and these in turn with large tenement buildings. Not only were the working places overcrowded and unhygienic, but the families of these workers were forced to live in congested quarters, ill-ventilated, unclean and insanitary to the extreme.

Tuberculosis has reached its highest morbidity and mortality rate among these poor working classes. They become centers of infection and spread the disease to all other walks of life, even reaching the homes of the landlords who are responsible for such community conditions.

This disease has become so prevalent that autopsy statistics show that from 70 per cent. to 85 per cent. of all people have at some time during their life been infected. Healed or inactive areas of the disease have been found in a large percentage of those dying from some other

cause. It is hard to explain why more do not succumb to tuberculosis but undoubtedly the fact that our working and living conditions do not tend to lower our resistance is the saving factor for many.

Some of our modern tuberculosis specialists contend that this disease is not infectious to adults. They argue that the focus of infection is contracted during childhood and in later life some undermining condition so lowers the resistance as to cause the disease to light up. These teachers have caused some to doubt if it is necessary to protect the working forces from the tuberculous employee in their midst. They even argue that the husband sleeping with the tuberculous wife cannot contract the disease from her. There is abundance of proof of this infection of children but this fact does not refute the arguments that overcrowding, unsanitary living and working conditions and even certain occupations are equally responsible for the spread of tuberculosis.

Therefore while tuberculosis may be classed as an industrial disease yet many conditions in industry have been responsible for maintaining and spreading it. Granting that the infection is one of childhood yet certain occupations and certain insanitary industrial conditions are responsible for the lowered resistance and the lighting up of the infection. Even if the presence of the tuberculous employee is not dangerous to his fellows yet these same working conditions can increase the activity and dangers of the disease for him and therefore this fact makes it imperative to remove him from the working place until he has recovered.

The irrefutable proof of these statements exists in the fact that in those industries where an active fight against this disease has been made the tuberculosis rate has rapidly decreased. With improved living conditions and plant sanitation, even though not directed especially at the prevention of tuberculosis, the disease has decreased. In those occupations, which have been directly responsible for lung trouble even crude preventive measures have decreased phthisis to a remarkable extent. And the seeking out of the tuberculous employee and removing him from the presence of his fellows, placing him under proper conditions for recovery, have resulted in decreasing both the morbidity and mortality rate.

The extent to which tuberculosis may be classed as an industrial disease may be disputed, but no argument can exist against the fact that improving industrial conditions decreases the tuberculosis rate. But the employer alone cannot be blamed for these deplorable conditions which make the disease so prevalent. Society at large is responsible to a certain extent. And society, through the official agencies of the state and federal governments, should improve all conditions tending to lower the nation's resistance and should in

addition provide the machinery for discovering and properly curing the tuberculous people among us. A concerted fight on the part of the nation against this disease would in time eradicate it completely and at the same time would solve most of the social evils coincidental with it.

The tuberculous, whether he is the single employee of a small shop or one of a hundred thousand working force in an industry, must be sought out and cared for. The conditions in his working place or in his home that made the disease possible must be removed. All who come in intimate contact with him must be examined for possible infection. In fact each individual case must be thoroughly studied and the possibilities of the spread of the disease from this source must be followed out in all its ramifications. Such a machinery will not only reach the tuberculous in adult life but will reach into childhood as well.

Under the incentive of war we have seen the nations mobilize their forces and concentrate their every effort against the common enemy which was spreading death and degradation among us. The medical forces, sacrificing personal wealth and aggrandizement, have responded gloriously in this fight. If we could maintain this same great war machine, and the civilian agencies, such as the Red Cross and all government agencies, after the war, to concentrate their efforts against tuberculosis, and all the other social diseases, devastating our people even more than war has done, it would result in a more glorious, far reaching victory than we are gaining over the Huns.

PREVALENCE OF TUBERCULOSIS IN INDUSTRY

It is not our purpose to classify all tuberculous employees as the victims of an occupational disease and thereby add to the liability of the employer in these cases. But rather to show that in some cases there is a legal responsibility and in many others a moral responsibility which must be assumed by the employer at this time in the absence of any state responsibility for these sufferers. And the physician in industry is in the strategical position to attack this disease where it is the most prevalent.

The causes of tuberculosis in industry can be divided into predisposing etiologic factors, the active cause being the bacillus of tuberculosis itself, discovered by Koch in 1880. The relationship to industry of some of these predisposing conditions is very remote, while others are so closely connected with certain industries that they represent almost an active causal agency. In the latter cases tuberculosis should be classed as an occupational disease, the employer being held liable for the condition. Only in this way will the proper

preventive measures be taken where these more or less active causes exist.

These predisposing factors to tuberculosis among employees are as follows:

1. Hereditary predisposition and family infection.
2. Poor housing and living conditions and other community conditions.
3. Alcoholism and other excesses..
4. Unsanitary working places and working conditions.
5. Tuberculous employees among the working force forming "foci of infection."
6. Prevalence of other diseases.
7. Injuries to chest and other injuries.
8. Specific occupational hazards.

The relationship of industry to hereditary predisposition and to family infection is indeed very remote and yet it exists. In certain industries, as for instance the textile workers of New England, or in the copper mines of Montana, the children often follow the parents into the mills or mines. Physicians in these communities have told me of members of families, for at least three generations, dying of this disease. Heredity and family infection have undoubtedly played their part but the working conditions have been responsible to a certain extent for these deaths. In some of these families where each succeeding generation has followed the occupation of the parents the signs of a hereditary predisposition to tuberculosis have increased in each group of children. The smaller stature, the narrow chest and the stooped shoulders of these children point to industries' responsibility toward them and toward society. Improved working conditions, with every preventive measure installed, would stop these family infections.

Poor housing and living conditions increase the number of tuberculous employees. Some industries have even provided long rows of tenements for their employees and their families. These poorly built homes, with their insanitary arrangements, and their dark, ill-ventilated sleeping rooms, have reduced the efficiency of their workers and caused disease to become more prevalent. Poverty among employees has forced them to dwell in unhygienic surroundings and to live under conditions which have been proven by many investigators to predispose to tuberculosis.

The employer should see that the community, responsible for furnishing him his labor supply, is cleaned up and kept clean; that his employees are paid a living wage and are subtly educated to proper living environments. All his efforts to improve health conditions in his plant can be undone by unhealthful community conditions.

Good business, as well as a certain moral responsibility, should force every concern to remove these predisposing causes.

Alcoholism, venereal diseases and many other forms of excesses, are acknowledged predisposing factors to tuberculosis, as well as a direct cause of inefficiency. Beer drinking during working hours has increased at an alarming rate among the workers of hundreds of different industries. Some of these employees will drink at least two gallons of beer during the day. This is encouraged by some employers, and not prohibited by others for the fear of losing these men. Other concerns have increased alcoholism by paying in checks and allowing the corner saloon to cash these checks. In many communities the saloon offers the only club facilities for the working class. They can go here and eat their lunches in warmth, and in the evening can find a warm place to congregate where facilities for games and amusements are freely furnished. In such communities the cheap dance hall is the only source of entertainment for the girls. Alcoholism, venereal diseases and late hours prevail, and result in tuberculosis and inefficiency. Society and the industries that do not provide the means of combating these conditions are responsible. Dr. Wilbur Post recognized the deleterious effects of alcoholism on the employees of a large industry in Chicago. These men were in the habit of "rushing the growler" during working hours, and to have their beer at the noon hour with whiskey in the morning and evening. He arranged through the management, to meet small groups of employees each day for a twenty minute talk, on the company's time. He gave these talks until every man in the concern had heard them several times. In a snappy, subtle way he drove home the undermining influences of this constant use of alcohol, and in time decreased the sale of beer among these men over 75 per cent. Buttermilk was advocated as a substitute and the concern saw that opportunity for buying buttermilk was provided.

The environments of the working place are frequently the cause of tuberculosis, and here the industry is more directly responsible for the disease. Overcrowding of working places was best exemplified by the sweat-shops among garment workers so prevalent a few years ago. Doctors Price and Scherechewsky found in 2000 garment workers in New York a tuberculosis rate of 5 per cent., whereas among 1000 steel workers they only found .9 per cent. affected with this disease.

Poor ventilation usually is coincident with overcrowding. Vitality is practically always reduced by ill ventilated, contaminated working rooms. The presence of inorganic dust and of pathogenic bacteria thrown off from the workers in the room add greatly to the disease hazard.

Lack of facilities for the proper removal of dust is another hazard

for tuberculosis. Dry sweeping in the rooms, where people are employed is one of the most dangerous practices. Dust created in many occupational processes is known to be especially predisposing to respiratory conditions. Ventilators, fans and artificial means of removing dusts are imperative; where such appliances are neglected there is a direct responsibility on the employer for the cases of tuberculosis which develop.

Forcing employees to work constantly in dark, damp places is a cause for lowered vitality and a predisposition to tuberculosis. That such working places cannot be avoided at times may be granted, but no man should be forced to work there day in and day out. These employees should be changed frequently, say every three weeks, to outside employment. They should also be subjected to more frequent physical examinations and other forms of health supervision to prevent the incipient development of this disease.

Exposure to extremes of heat and cold, and other forms of poor temperature and humidity provisions, is another predisposing factor in industry which is responsible for many cases of phthisis.

Industrial sanitation is the means of removing all these factors and that industry which neglects the environments of its working force should be held liable for its tuberculous employee.

Employees working in intimate contact with each other, are constantly exposed to the diseased fellow employee in their midst. This is true of tuberculosis as well as all contagious diseases. These men with tuberculosis, where proper supervision does not exist, will continue to work as long as they are able, and meanwhile the disease is advancing and the number of germs thrown off by their coughing and spitting increases daily.

The author found twenty-six cases of tuberculosis among a large number of packers in two years. The sources of infection were removed and in the next seven years only seven cases of this disease developed among this force. While proper supervision accounted for part of these results, yet the segregation of these sources of infection undoubtedly removed the cause of contamination.

Ten years ago when the physical examination of employees in industrial concerns was first advocated, it was met with every form of objection. But today it is recognized as one of the greatest efficiency measures, as well as the most advanced public health movement, which can be adopted. It is the greatest means of health supervision, and health supervision of employees forms the very foundation of all common-sense efforts at so called welfare work. Every employer should see that his working force is carefully supervised in order to discover and remove these foci of infection—the tuberculous employees.

Certain industries, due either to unsanitary conditions, or the nature of the work, or the location of the plant, seem predisposed to other respiratory diseases. These diseases are often the cause of the lighting up of a case of tuberculosis. It behooves every concern, therefore, to combat these antecedent diseases. When the causes for them exist in either the working place or in the community, every effort should be made to remove the same in order to prevent the worst disease—tuberculosis.

Following the epidemic of so called grip, in the winter of 1915, the author found eighteen cases of tuberculosis in the month of March among employees who had been working in a concern where careful medical supervision was in vogue. Twelve of these employees had been thoroughly examined during the preceding year, and no evidence of tuberculosis was found. This epidemic was responsible for lighting up the disease. Our efforts, which resulted in controlling the "grip" epidemic, and in reducing the sick rate among these employees to a much lower percentage than that in the community at large, undoubtedly reduced the number of tuberculosis cases which followed in its wake. Overcrowding, poor ventilation, fatigue, and lack of immediate medical care, are directly responsible for the increasing number of so called grippe, or epidemics of streptococcic respiratory conditions among employees. These epidemics are becoming more and more a cause of immediate high absence rate among employees. The extent to which they are contributing to absenteeism in the following months, chiefly because of tuberculosis cannot be estimated.

Cigar makers are more subject to these milder respiratory conditions, and they are also known to have a higher tuberculosis rate than many other employees. Protection against these milder conditions would result in a lowered tuberculosis morbidity.

These two examples are sufficient to point out the responsibility of the employer in protecting his working force from those influences which cause these antecedent diseases which often result in consumption.

Sir Thomas Oliver, in his book on Diseases of Occupation, has devoted considerable attention to the relationship between traumatism and tuberculosis. He describes several cases of injury to the chest in men who later developed tuberculosis. Some of these had been examined previous to the injury and no sign of tuberculosis was discovered, neither was there any family tendency to this disease. One case, a previously healthy male, two weeks after a severe blow on his chest, developed a pleurisy. This man continued to lose weight and grew rapidly worse. A few weeks later his physician found tubercle bacilli in his sputum. Under proper treatment the man finally

recovered. The conclusion was reached that the trauma was responsible for the disease.

In my experience, I have had twelve cases of traumatic pleurisy. All of these followed a direct injury to the chest wall; none had evidence of fractured ribs. One of these developed the signs and symptoms of tuberculosis, but the germs were never found in his sputum. After three months of treatment which corresponded in every respect with the treatment of tuberculosis, the man recovered. At the time of the injury a stethoscopic examination of his chest revealed none of the signs which later developed. This stethoscopic examination of every injury to the chest wall is very important, and will often enable the physician to prevent an injustice being done to either the employer or employee.

One of the above cases was struck in the lower side of his left chest by a falling box. He reported to the doctor's office at once. The routine examination with the stethoscope was made and signs of tuberculosis were found in both apices. His sputum was immediately examined and found to contain the germs. An x-ray examination showed no fractured ribs, but revealed large areas of calcification and fibrosis in the lungs. The condition was explained to the boy and his family. It was carefully pointed out that this disease was already existent and active and that the blow had nothing to do with it. This concern followed its usual custom and sent this employee to a sanatorium for treatment, paying all of his expenses. He recovered and left the sanatorium in seven months and was again employed. The injury to his chest wall did not seem to increase his lung trouble. A case similar to this is described under the medicolegal chapter.

Another employee received a nail wound of the hand and developed a severe streptococcus infection. At his first general examination, made one week after the injury, no signs of tuberculosis were found. There was no family history of this disease. The infection in the hand persisted for several weeks and required extensive drainage under a general anesthetic. He finally recovered from this, but remained emaciated and did not regain his strength. About three months after the injury he began to cough and expectorate. Dullness and râles developed in the lungs and tubercle bacilli were found in the sputum. My opinion was demanded as to whether the injury was responsible for this pulmonary condition. The fact that there was no evidence of the disease one week after injury, and that his lowered resistance followed directly as the result of the severe infection, making it possible for this disease to develop, caused me to give the opinion that his injury was the predisposing factor, and the employer should be responsible.

There is no doubt but that injuries can predispose to tuberculosis,

and it is essential for industry to recognize the fact and take the necessary precautions against accidents, and provide the best of care for all injured in order to prevent this complication.

OCCUPATIONAL HAZARDS

Tuberculosis follows so frequently in the wake of certain occupations that these have come to be recognized as definite predisposing causes for the disease. Just as plumbism is a definite occupational disease for which employers may be held legally liable, so tuberculosis should be classed as an occupational disease when it develops in certain industries.

Frederick S. Crum in his treatise on "The Mortality from Diseases of the Lungs in American Industry," Hoffman and other excellent authorities, have definitely demonstrated that certain occupations are directly responsible for this pulmonary condition.

Those industrial processes which contaminate the atmosphere of the working place with inorganic or organic dusts are especially predisposing to pulmonary tuberculosis, as well as to other respiratory diseases. It is estimated that approximately 5,500,000 wage earners of both sexes, or 12.5 per cent. of the total wage earning force of the country work under conditions where this atmospheric pollution is very prevalent, and of known hazard to the employees. A careful investigation in many of the smaller concerns, and of the more obscure occupations, would undoubtedly reveal a higher percentage of workers exposed to dust hazards.

The metallic dusts, with their millions of jagged, angular microscopic particles floating in the atmosphere, are probably the most hurtful to the lung tissue. The constant irritation from these particles causes a fibrosis which is a favorable garden spot for the tubercle bacillus, or may cause death from some other respiratory disease.

Mr. Crum based his study on the experience of the Prudential Life Insurance Company which for years has kept careful statistics on the causes of death among policy holders engaged in these dusty occupations. He says, "In the Prudential experience the group of occupations exposing the workmen to metallic dust shows the most disastrous results, as evidenced in the mortality returns from both tuberculosis of the lungs and other respiratory diseases. At ages 25 to 34, taking the group as a whole, of the total deaths 53.9 per cent. were caused by tuberculosis of the lungs and 8 per cent. were from other respiratory diseases. Respiratory diseases at this age period together caused an excess mortality of 25.3 per cent. if comparison is made with the mortality from these diseases in the non-dusty occupations. At ages 35 to 44, tuberculosis of the lungs caused 44.7

per cent. of the total deaths and the other respiratory diseases caused 9.7 per cent. In other words, respiratory diseases, tuberculous and non-tuberculous, caused 54.4 per cent. of all the deaths of occupied males, ages 35 to 44, in the group of occupations exposing to metallic dusts, in the Prudential experience. This represents an excess mortality from these causes of 22.2 per cent. as compared with the non-dusty occupations in the same experience.

Specific occupations in this group with exceptionally high mortality from lung diseases are cutlery makers, file makers, metal grinders and polishers, brass workers, printers, engravers, tool makers. gold beaters, etc.

Metal grinders, polishers and buffers invariably show a high mortality from respiratory diseases as a direct result of their inhalation of metallic dust particles. The peculiar effect on the lungs of metallic dust is described by some writers on occupational diseases as "grinders' rot."

In the Prudential experience, metal grinders and polishers show an excess mortality from tuberculosis of the lungs at ages 25 to 34 of 60 per cent. and at ages 35 to 44 an excess of 107.1 per cent. The mortality of this class of workmen from other diseases of the lungs was practically the same as ages 25 to 44 as in the non-dusty occupations.

The oft quoted figures from the medical officers of health of Sheffield, England, show that for the period of 1889 to 1910 tuberculosis caused 43 per cent. and other respiratory diseases 24.9 per cent. of the deaths among grinders.

Most mineral dusts cause a high mortality rate from tuberculosis. During the period of 1907 to 1914 in Montana the mortality report among copper miners shows that out of 1614 deaths, for ages of 15 and over, 611 or 37.9 per cent. were due to tuberculosis, and 364 or 22.6 per cent. resulted from other respiratory diseases. In this registration area the male deaths for the same age period showed 14.1 per cent. due to tuberculosis and 10.8 per cent. to other respiratory causes. These figures certainly demonstrate that copper mining is especially hazardous and results in excessive mortality from consumption.

Coal miners and cement workers seem to suffer the least from the dust created by their occupations. In fact colliers in well ventilated coal mines were found to have a comparatively low mortality rate from this disease according to F. A. R. Russel of the Smithsonian Institute who wrote on this subject in 1896.

Quoting again from the Prudential experience among stone and marble cutters, planers and polishers, we find these occupations particularly hazardous if we are to judge from their mortality returns. The excess mortality from tuberculosis of the lungs at ages 25 to 34

among these workmen was 40 per cent. and at ages 35 to 44 it was 34.4 per cent. This experience is confirmed by other data and it has long been a well known fact that stone cutters are very liable to a fibroid form of pulmonary tuberculosis. In Washington County, Vermont, the general mortality returns are available for the six year period, 1900 to 1905. These statistics show that pulmonary tuberculosis caused 46.2 per cent. of all the deaths among these workers and other respiratory diseases caused 14.7 per cent. of the total mortality. Diseases of the respiratory system, tuberculous and non-tuberculous, were, therefore, responsible for 60.9 per cent. of all the deaths of stone and marble workers in Washington County, Vermont, during 1900 to 1905.

Such terms as "grinder's rot," pneumoconiosis, silicosis and others, prove that both the laity and medical profession have recognized the existence of these conditions among employees subjected to metal and mineral dusts.

The cotton and linen textile workers, wood workers and paper makers are exposed chiefly to vegetable dusts. The mortality rate from tuberculosis among these employees has been excessively high. Cotton spinners at ages of 35 to 44 were found to have an excess mortality of 90 per cent. when compared with non-dusty occupations for these ages.

Animal and mixed fiber dust has also been found very injurious to the lungs. For example, among hat-makers the mortality rate from tuberculosis was 60 per cent. for ages 25 to 34, according to Mr. Crum. The death rate from lung diseases among leather workers, especially boot and shoe employees, has been notoriously high. In Oxford, Massachusetts, a boot and shoe factory showed a record of one death out of every six of its employees due to tuberculosis. Carpet weavers, upholsterers, silk and woolen mill employees, furriers, workers in hair and hair goods, mattress makers, garment workers and employees in many other occupations, are exposed to this animal and mixed fiber dust.

Workers exposed constantly to street or municipal dusts were found to have a high tuberculosis mortality rate, judging from the Prudential experience. Street car conductors and street cleaners were especially affected by this form of dust. This should be given more thought as many physicians have been in the habit of recommending teaming or the occupation of chauffeur to the arrested case of tuberculosis.

The occupations where general organic dust was prevalent all showed an increased mortality rate from tuberculosis. For instance, bakers, candy-makers, millers, harness and shoemakers, tanners, button makers, glove makers, tobacco workers, celluloid workers,

and grain handlers, showed a death rate of 51.8 per cent. from this disease according to the Prudential statistics.

These examples of the occupational hazard of dust caused Robert Hessler (Dusty Air and Ill Health) to say, "Tuberculosis is really a protest against bad air conditions, just as typhoid is a protest against bad water."

In England, Sir James Crichton Browne summed up his experiences on "The Dust Problem" as follows: "Industrial dust, *per se*, apart from poisonous or pestilential mixture, is a sufficiently interesting theme from a sanitary point of view, for the returns of mortality reveal that notwithstanding the highly successful crusade against it, which has been and is being conducted by our factory inspectors, nobly assisted now by local authorities, intelligent employers, and awakened workpeople, it is still responsible for an appalling amount of suffering, disablement and death.

"The mortality of the principal dust producing occupations, compared with that of agriculturists who live and work in what is practically dustless atmosphere, is excessive to a startling degree. It is not suggested that this excess is to be ascribed to dust alone; no doubt various factors contribute to it, but the facts that it is due mainly to respiratory diseases, that it is distributed among the several occupations pretty much in proportion to their dustiness, and that it has diminished in some instances where dust has been effectually dealt with, justify the conclusion that it is largely dust-begotten."

Many other occupations have shown a high mortality rate from tuberculosis among the employees. This field has only been scratched, and it behooves all physicians in industry to seek out those occupations which are especially deleterious to the lungs and make comprehensive reports on the same.

One of the earliest contributions to the relationship between phthisis and occupation was that of Perrond in 1875. This writer drew attention to the prevalence of this disease among the sailors on the Rhone, and attributed it to the fact that these men pressed their chest wall on the pole of the rudder in steering the ships.

Schereschewsky has repeatedly pointed out that the cramped, stooping posture which employees must assume in certain occupations, is responsible for many of the lung conditions which they develop. For example, the posture of the garment workers has the effect of limiting lung expansion with a consequent poor nutrition due to suboxidation and a resulting lowered resistance to respiratory diseases. Again, the grinder and polisher presses the object he is working on against the chest, reducing thereby his respiration, and thus adds this factor to the hazard of dust.

Dr. James Britton of Chicago found a much higher rate of tuber-

culosis among the 1000 clerks of a large industry located in the city than among the factory employees working at the outskirts of the city. The former had far better environments in their working places than the latter. But the sedentary work and the posture assumed when sitting at the desk evidently lowered the resistance of these clerks.

The author's experience was quite similar to that of Doctor Britton. In 300 cases of tuberculosis among employees of a large industry 31 per cent. were among the clerical force, which constituted about 30 per cent. of the entire force. Packers and allied workers made up about 10 per cent. of the force, and furnished 13 per cent. of the cases of phthisis; approximately 3 per cent. of the employees were truckers and 6 per cent. of the cases were found among these. Their work, as a rule, subjected them to considerable exposure to dust. A comparatively small force of porters were employed, yet 3 per cent. of the tuberculosis cases came from this group. This bears out the experience of other authorities that porter work is particularly hazardous as regards phthisis. Better measures must be adopted for sweeping and the handling of cuspidors and other refuse in order to protect these porters against infection.

Among the clerical workers the stenographers showed a greater tendency to the disease. No better argument can be advanced for rest periods with exercise, especially deep breathing exercises, and for educational campaigns on the need of proper recreation at the noon hour and in the evening, for these stenographers and other sedentary workers in industry.

Old paper gathered up in the various departments and old paper bought up from rag pickers is put through paper cutting machines and used by many concerns for packing purposes. The dust from this paper is undoubtedly contaminated with pathogenic organisms to a marked degree. Straw used in packing is also very dusty. These materials add greatly to the hazard of this occupation. When this fact was pointed out to one large concern they immediately built a factory in Northern Michigan and made excelsior to be used for packing purposes. This clean material, with its decreased dust, plus the fact that the sources of infection were removed, by discovering and eliminating all tuberculous employees in their working force, has been the means of reducing phthisis among their packers.

These examples of the tendency of certain work to predispose to tuberculosis are sufficient to prove that the employer who fails to take proper precautionary measures to prevent this disease among his employees, engaged in these hazardous occupations, should be held responsible for this the same as for any other occupational disease.

PREVENTION

What measures therefore are necessary to prevent tuberculosis among employees?

They are (*a*) eliminate the tuberculous from the working force; (*b*) protect the employees from the predisposing causes; (*c*) supervise the physical condition of the workers by medical examinations.

The examination of all applicants for work furnishes the only means of preventing these foci of infection, the tuberculous, from mingling with the old working force. Likewise, the constant supervision of the health of the old employees by medical examinations will reveal those who have developed this disease and who must also be eliminated from the working place. There is sufficient evidence of the spread of tuberculosis from one individual to another by close daily contact, especially when predisposing conditions in the work lower the resistance of the employees, to warrant the segregation and even the isolation of these cases.

Protection of the workers against the predisposing causes is the duty of every employer and should be made legally compulsory. This is not a hardship or an unjust demand on any concern for protection against this disease always means an improved working environment, a healthier more contented working force, decreased labor turn-over and therefore increased production. An enlightened business world should grasp these facts and voluntarily protect the labor market from this and other destructive diseases.

These preventive measures have been set forth at length in numerous other places in this book, especially under Industrial Hygiene. In combating tuberculosis the ventilation including dust removal, temperature and humidity and cleanliness of the working rooms are the three most important conditions for industry in general to consider. Overcrowded, dark, damp, ill ventilated, stuffy rooms have been responsible for hundreds of thousands of deaths from phthisis. These conditions plus dusty occupations are the great allies of the tubercle bacillus. So easy to prevent, and yet what an economic waste they have caused during the centuries.

In the best conducted business these faults will creep in. The primary object of the management is to maintain production. The employees are directly absorbed with their work. Therefore, it is necessary for the physician in industry to concentrate his efforts on these preventive measures. Frequent inspections of the working places must be made; tests of the ventilation, of the temperature and humidity of the atmosphere must be made a routine part of his work. In a large concern it is well to assign this duty to one doctor who must be held responsible for maintaining health standards in the working place. His recommendations should be made to the

highest authority in the management and repeatedly made until faulty conditions are corrected.

In those occupations where dust or fumes are created, especially when of a known hazard to the lungs, every facility must be provided for the proper removal of the same. These consist of hoods, large conducting pipes, suction fans and other apparatus. In some concerns where great attention has been given to this hazard, practically all dust is eliminated from the rooms. Instead of throwing this dust into the outside atmosphere it is often collected in bags or rooms provided for the purpose and salvaged. This salvaging process alone has paid many times over for the expense of installing the necessary system.

The removal of dangerous fumes is just as essential for often these fumes, as for instance, lead, will predispose to tuberculosis even without causing the specific occupational disease.

A factory, with both hazards of dust and of fumes, was recently inspected. The management was very proud of the fact that it had provided protective measures for the employees. The hoods, which cost $50,000 to install, were pointed to with pride. But these hoods were some four feet over the lead vats; other hoods for dust removal were covered on their exterior with the fine metal dust. The dust that was collected discharged from a pipe just outside the building and much of it was blown back into the room through an adjacent, open window.

The physician should always demand the services of an expert industrial engineer to take charge of installing ventilation and dust and fume removal systems. Concerns will meet the problems more thoroughly and will save needless expense by employing such engineers.

The use by employees of a non-irritating, simple respirator, should be enforced in all occupations where dust and fumes prevail. Such respirators are often furnished by the employer, but no effort is made to compel their use.

Educational campaigns among the employees is the greatest means of securing their co-operation in all these preventive measures.

Excellent reports on the reduction of disease in certain hazardous occupations by the use of these various devices, coupled with educating the employees to their use have been published by the Pennsylvania and New Jersey Departments of Industry and Labor, as well as by the United States Department of Labor. These furnish irrefutable evidence that tuberculosis can be controlled in these occupations. The next step for these governmental agencies is to provide means of punishment for those industries which continue to neglect precautions.

The benefits derived from a healthful working place may be com-

pletely nullified by faulty home conditions and insanitary community surroundings. While the employer cannot be held legally responsible for these, yet it behooves him to see that they are corrected. This is another duty for the medical staff. Co-operation with the city and state health authorities will improve community conditions which should always include housing conditions. By the aid of the visiting nurses, and by subtle suggestions from the doctors and often by actual assistance from the employer better home conditions can be obtained for most of the employees.

The third great preventive measure which every industry, and every small employer should adopt is the constant supervision of the physical condition of the employees by medical examinations. The method of doing this is dealt with in other chapters. To reiterate though, some system must be established whereby every employee will be examined and re-examined whenever necessary. Those working in dusty occupations, in rooms which must perforce be dark or damp, or where other hazards exist, should be examined at stated intervals, preferably every month, and certainly every three months. These examinations will enable the discovery of all tuberculous cases in an early and therefore curable state. Combined with the examination of applicants they furnish the means of eliminating these cases from the working force.

After a man has been cured of tuberculosis he should be allowed to return to the industry to work at his old occupation, if no hazard for the disease exists there, or in some allied occupation. These apparently cured cases therefore furnish another group of employees who should be periodically examined to guard against a recurrence.

TREATMENT OF THE TUBERCULOUS EMPLOYEE

The elimination of the tuberculous employees from the working place means excessive hardships for them and their families, and often is a very decided contributing factor to their deaths, unless provisions are made for their proper care, preferably in sanatoria, and the adequate support of their dependents during the period of treatment. Until recent years no such provisions were made for the treatment of these cases, resulting therefore in a high death rate particularly among the poor.

To-day, chiefly because of the efforts of the members of the National Tuberculosis Association and the various state and municipal tuberculosis institutes, there are numerous sanatoria scattered throughout the country where free, or very reasonable, treatment can be given to these sufferers. Massachusetts has established such sanatoria in several counties and plans to have one in practically every

county of the state. A few other states are planning similar provisions. Several state sanatoria have been established and a few county and municipal sanatoria. Chicago's Municipal Sanatorium is one of the most representative of the latter.

Adequate provision for the support of the families during the period the wage earner is under treatment has not yet been made. The reports of any United Charities Organization in the country will show that they have furnished relief to hundreds of such families. The motive back of this relief has been noble and it was necessary, but charity in any form should not be a part of the social and economic mechanism of our country. Charity, when interpreted as brotherly love, should provide sick insurance or some other self-respecting means for the support of these dependents.

Even with the establishment of these sanatoria no state has yet provided the machinery for the early discovery of the cases of tuberculosis. All authorities agree that the disease is usually curable when treatment is started in the incipient stage. In spite of this knowledge the death rate still continues high in most sanatoria because the cases were not admitted until the disease had reached the second or third stage.

The medical profession is responsible for this condition in many cases. Lack of ability to diagnose the disease in its incipiency, failure to thoroughly examine each patient, and temporizing with the condition by trying ambulatory or home treatment are the three most appalling mistakes which the family doctor makes with his tuberculous patients. The patients themselves often pay no attention to the early symptoms, dragging about their work, trying patent medicines and home remedies, and when finally forced to consult a physician the disease is in an advanced form, often incurable or entailing a heavy financial loss to both the patient and the state because of the longer period of treatment necessary.

Even more essential than the establishing of sanatoria is for the state to provide the necessary machinery for the early detection of the consumptive and to make treatment compulsory during this early stage.

The work of many industrial medical staffs has demonstrated the value of periodical medical examinations as the best means for detecting the early cases. Also many concerns have provided sanatorium treatment, free of charge, for their tuberculous employees and have thus reduced the length of treatment and the death rate on account of this disease to a most marked degree.

Sick insurance, based on the fundamental principle of *prevention first*, would undoubtedly provide for the periodical examination of all workers. If the prevention idea is to be the basis, sick insurance

should be compulsory for everybody. The machinery established to carry on this work would be the means of finding the tuberculous in our midst in this early, curable stage.

Many municipal health departments provide consultants who visit every contagious case reported, to ascertain if the diagnosis is correct and if proper precautions are taken. Physicians who fail to report these cases early are legally responsible. A similar plan should be adopted in regard to tuberculosis. Early reporting, competent consultants to visit these cases or centers where they could be referred for examination combined with sanatorium treatment for all positive cases, and suitable provisions for the suspicious ones, would be one of the greatest life saving measures which the state could adopt. Punishment for the doctor failing to report his tuberculous patients early would soon eliminate the majority of these second and third stage cases which now seek sanatorium care.

It is quite evident that tuberculosis has so many predisposing causes that in the majority of cases it is impossible to say which one has been responsible. Most of these causes however are found in the social and economic fabric of our every day existence. It can really be classed as a social disease, the prevention and cure of which is a state duty.

In the absence of the state assuming this responsibility we have many examples of wonderful provisions for the care of the tuberculous by various organizations, by philanthropic citizens, and above all by certain individual industries. These latter have provided every means for prevention in the plant, and, when an employee is assailed, every opportunity for the best of treatment. No chapter on the tuberculous employee would be complete without setting forth in detail examples of this care on the part of certain concerns.

In 1906 an effort was made by a few of the large manufacturers of Providence, Rhode Island, to exterminate tuberculosis in their factories. Large placards were placed in conspicuous places advising all employees with suspicious lung symptoms to report to Dr. Frank Fulton, who offered his services gratis, for examinations. The object was to diagnose the disease, if possible, in its early stages. Some eighteen cases were discovered and proper home and sanatorium treatment established. As a result, all of these workmen recovered and were able to return to work.

A few years ago in Hartford, Conneticut, 10,000 employees of various factories, mills and other industries organized to protect themselves and their families from the ravages of tuberculosis. The owners of these industries agreed to give a sum equal to that raised by the working men and women to fight the disease. Adequate medical aid was called into service, and by means of home and sanatorium

treatment they were able to greatly reduce the death rate from consumption.

In Oxford, Massachusetts, a boot and shoe factory showed a record of one death out of every six of its employees due to tuberculosis. In 1904 a systematic educational campaign was organized among the workers in this factory, its purpose being to instruct them as to the nature, cause and prevention of consumption. Also the owners paid for free treatment for three months in a sanatorium for those employees afflicted with the disease. As a result the deaths greatly diminished, and in 1907, three years later, only four people died of consumption in Oxford. A similar movement started in Worcester, Massachusetts, showed equally marked results.

In 1909 the author started a system of medical examination of employees in one of the large industries of Chicago employing at that time about 10,000 people, and now having approximately 15,000 employees. A great many different types of occupations were represented here, including clerical work of all kinds, printing, packing, warehouse work, all kinds of merchandizing and approximately forty different manufacturing processes. Examples of a majority of the occupational hazards could be found in this plant.

The medical examinations were first made for the purpose of discovering the tuberculous employee, but it soon extended into a thorough examination in order to discover all other physical defects. After three years, in 1912, the medical examination of all applicants for work was introduced, and now is one of the most vital functions of the medical staff of this industry.

From January, 1909 to the end of December, 1917, 869 cases of tuberculosis were discovered among these employees or applicants for work.

Since 1912, 245 of these cases were found among the applicants, 0.7 per cent. of all examined. About sixty of these cases were not positively diagnosed, but had such unmistakable signs of the disease that they were rejected. Others with suspicious findings in the lungs, yet apparently healthy, were employed but were re-examined at frequent intervals until the signs cleared up, or a positive diagnosis could be made. This policy accounts for the fact that the highest percentage of cases found in the old working force has been among the three to twelve months employees. So many suspicious cases clear up however that a great injustice would be done these applicants if they were rejected for lung trouble. This also accounts for the lower tuberculosis rate among these applicants (0.7 per cent.) as compared with the rate among the total examinations made (1.7 per cent.).

The medical staff reported all of these applicants to the City Health authorities and to the Chicago Tuberculosis Institute. The

visting nurse followed up all cases to see that they were under some form of supervision. It is a waste to all industries to throw these tuberculous cases back into society without endeavoring to place them under proper treatment. If every concern would adopt this system they would protect one another from the contamination of their employees by the diseased employee of some other plant. Your tuberculous employee may occupy the same boarding house, may even sleep with one of the force of another plant. The ramifications of the spread of the disease are so intricate that a good business sense should dictate a policy of joining hands against this common enemy.

The 624 cases of tuberculosis among the old employees were divided as follows:

Table 12

Suspected tuberculosis	94
Pulmonary tuberculosis	
first stage	321
second stage	128
third stage	44
Tuberculous glands	23
Tuberculous bones	6
Tuberculous spine	3
Tuberculous meningitis	1
Tuberculous peritonitis	1
Tuberculous kidney	1
Tuberculous eye	1
Tuberculous tonsil	1
	624

The 94 suspected cases gave the clinical findings of tuberculosis, but were never positively diagnosed. These cases, however, were sufficiently suspicious to be eliminated from the working force and placed under active treatment until they had recovered. The majority of these were given home treatment, and later, when it was safe to stop more careful medical supervision, they were often sent to the country.

Hundreds of cases, not shown in the above table, were found with symptoms indicating a threatened tuberculous condition. For instance, many employees would become anemic, lose weight, complain of night sweats or stomach trouble, and other symptoms, pointing to a generally run down condition. No definite diagnosis could be made, but nevertheless vacations were secured for them, and they were placed on a general building up régime, many going to the country to rest and recuperate. Unquestionably a number of such employees would have developed an active tuberculosis if they had not been detected at this stage and these precautions taken.

From the very beginning of this work this concern provided free treatment for 4 tuberculous employees. While their occupations were not responsible for the condition, except in a very few instances, yet the fact that these people were forced to quit work for the protection of the rest of the employees, caused the management to feel a certain moral responsibility for their care. The first two years this free treatment was given only to those employees who had worked for the concern more than one year, but since then every case was offered the free treatment. Except in a few of the early stage cases

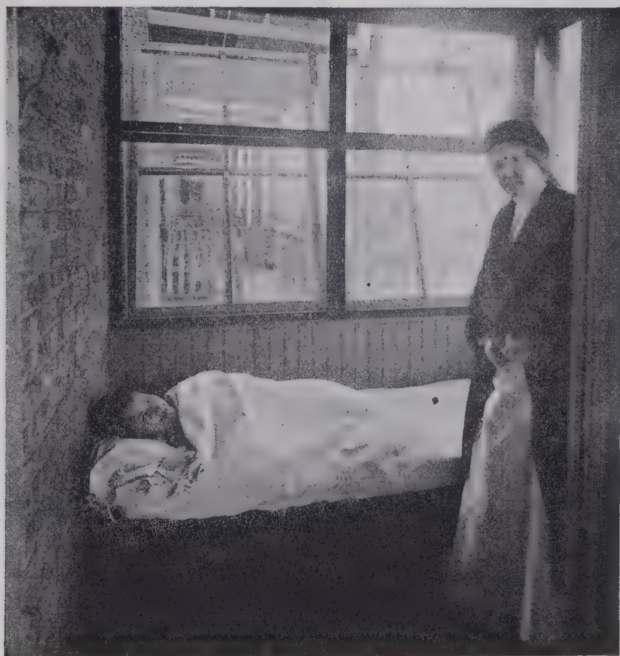

Fig. 60.—A tuberculous employee under treatment at home. The visiting nurse on her bi-weekly call.

with unusually good home surroundings, or where the employee was from the country and it seemed advisable for him to return there, sanatorium treatment was advised for all. Many at first refused to go to a sanatorium, but each succeeding year made it easier to persuade the tuberculous employee to accept this form of treatment. For those who refused to go arrangements were made for proper treatment at home, either directly under the care of the medical staff or under their family physician. The visiting nurse was of the greatest help in supervising this treatment in either plan. (See Fig. 60.)

Often the home conditions were totally unfit for the proper treatment of the case; or were not suitable for the patient to return to

after completing the sanatorium care. The doctor reported these conditions to the management and in almost every instance the family was persuaded to move to better surroundings. Money was furnished, whenever necessary, to stand the expense of moving and of preparing a suitable sleeping porch for the patient. At first considerable difficulty was encountered with many family physicians, but of recent years these doctors have co-operated in the work chiefly

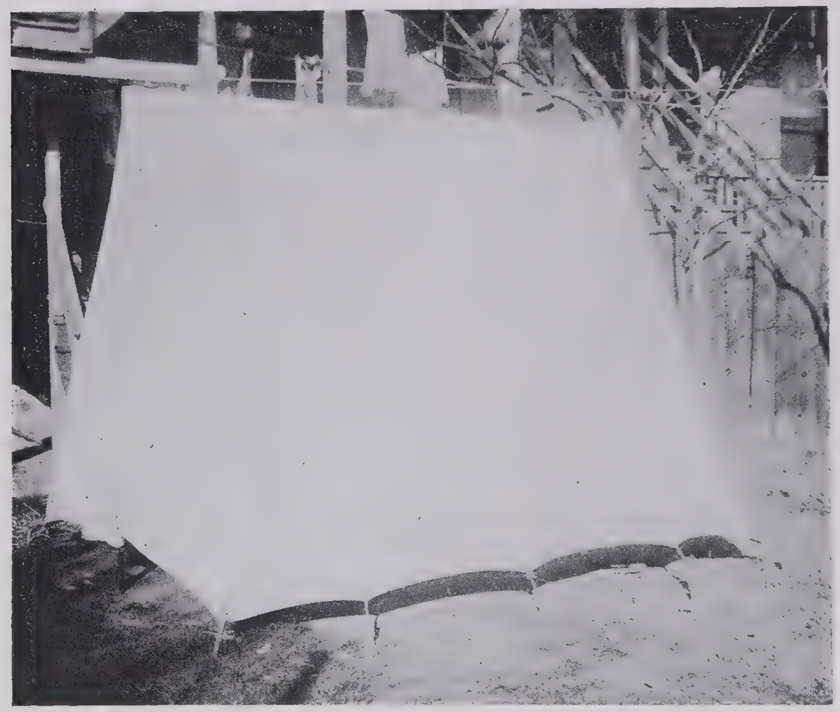

Fig. 61.—A tent erected in the rear of a flat building where a tuberculous employee after returning from the sanatorium continued his treatment.

because they know that every facility for properly diagnosing the case is used by the medical staff and that the treatment afforded by them gives better results than any home treatment which they can offer.

The 530 cases which were positively diagnosed were treated in the following places:

Table 13

In sanatorium	370
At home	108
In the country	40
Lost track of	12
Total	530

The first two years of this experience only thirty-four cases out of one hundred and sixteen consented to sanatorium treatment, whereas in the last two years, one hundred and twenty of the tuberculous employees accepted the offer of free sanatorium care out of one hundred forty-two cases. This proves the value of educational work among the employees and also is positive proof of the good results obtained.

The sanatoria chiefly used were Edward Tuberculosis Sanatorium at Naperville, Illinois, the Winifield (Illinois) Sanatorium belonging to the Chicago Jewish Aid Society, the Chicago Fresh Air Sanatorium, the Valmora Sanatorium of Watrous, New Mexico, and others. All but sixty of the cases were treated in home climates. There was practically no difference in the results obtained between the local climatic conditions and those afforded by the high altitude and climate of the West. The greater willingness of the employees to go to a sanatorium near home and the happier frame of mind on the part of both the patients and their families has caused us to favor treatment in their home territory.

The results of this treatment are shown in Table 13.

TABLE 14

Cured	236
Arrested	67
Improved	44
Unimproved	5
Deaths	30
Lost trace of	113*
Still under treatment	33
Total	530

The average length of treatment for patients in sanatoria was six months; and for those receiving non-sanatorium treatment ten and two-third months. Of the total number of employees who have received treatment approximately two hundred fifty have returned to work in the same concern, at their old occupations or in some other position less hazardous. There have been twenty recurrences among those cases kept under observation and in all but three of these the disease has again been arrested. This is a far lower recurrence rate than is usually found in this disease, thus demonstrating the value of health supervision. The use of short vacations when threatening symptoms developed prevented many of these employees from breaking down.

Twenty-nine out of the forty-four third stage or advanced cases were found during the first two years of this work. Ten of the deaths

*Since their discharge from treatment.

occurred during the first two years the remaining twenty deaths were scattered through the last seven years. (See Fig. 62.)

These two facts substantiate the claim that physical examination of employees enables the discovery of tuberculous cases in the earlier stages, thereby reducing the death rate, and shortening the time of treatment necessary for a cure.

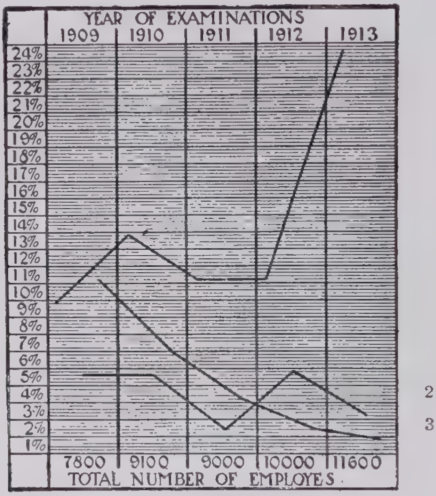

Fig. 62.—Reduction in number of cases of tuberculosis found and in the death rate as number of employees examined increases. 1, Per cent. of employees examined from total number. 2, Per cent. of tuberculous employees found among number examined. 3, Per cent. of deaths among those found tuberculous.

The age periods at which these tuberculous cases were found were as follows:

Table 15

Age	Per cent. of cases
15–20	21.0
20–25	34.4
25–30	23.9
30–35	8.0
35–40	5.0
40–45	4.1
45–50	3.0
50 or over	0.5

While the tuberculosis rate decreased markedly after the age of 35, yet the discovery of this disease among the applicants and new employees resulted in a very noticeable reduction in the incidence among the older force. For example in 1909 there were only five hundred ten employees who had worked at the plant for five years or more, but 33 per cent. of our tuberculous employees were found among these. Six years later, in 1914, there were two thousand

Sears shack, Edwards Sanatorium, Naperville, Ill.

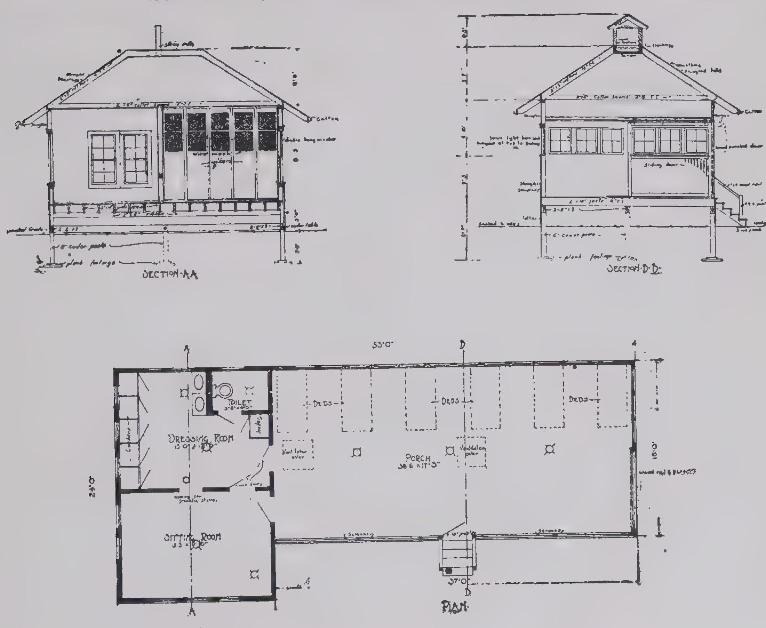

FIG. 63.—Plan of sleeping shack for six patients.

forty-nine people who had worked here for five years or longer, and only 13.8 per cent. of the tuberculous were among this number. This result was obtained by constant health supervision, by eliminating the tuberculous applicant and by improved working conditions. Fig. 52 illustrates very graphically this decrease in tuberculosis among the older employees and also shows the great advantage to the concern of examining applicants for work. There were only eight hundred thorough examinations made in 1909 when one physician was employed, whereas in 1914, with six physicians, twelve thousand three hundred eighty complete examinations were made.

The results obtained from discovering and reclaiming the tuberculous employees in this concern has been one of the most gratifying features of the medical work. The co-operation of the management has at all times been of the greatest aid, and their example has influenced other industries, especially in Chicago, to adopt a similar program.

In 1910 because of the limited capacity in Sanatoria great difficulty was experienced in securing prompt admission of our patients. The result was that the management erected a shack at the Edward Sanatorium for the accommodation of more patients. Since then the Chicago Telephone Company, the International Harvester Company, Montgomery Ward and Company, and Swift and Company have each built shacks at this sanatorium for the use of their employees. (See Fig. 63.)

In 1911 thirty of Chicago's largest industries contributed the funds for the establishment of a sanatorium at Watrous, New Mexico, where their employees could receive treatment at the lowest possible cost. This is known as Valmora Sanatorium. Over four hundred employees of these concerns, or members of their families, have received treatment at Valmora during the last nine years and the results have been most excellent. This was one of the first sanatoria to adopt graduated exercise, in the form of work, for its patients. (See Fig. 64.)

In 1915 the Ford Motor Company introduced this plan of giving free sanatorium care to every tuberculous employee. It has even extended this policy to the tuberculous applicant for work. A sanatorium near Detroit has been developed where these employees are sent until the disease is arrested. They then return to the plant, are put to work in some outside occupation and are carefully supervised by the medical staff. Most of these cases have been placed on the work of salvaging the scrap iron which previously was sold as junk. This salvaging process, done by salvaged employees, netted this concern a profit of $78,000 in one year. Large dividends from a simple humanitarian effort! The profit to these employees and their families cannot be shown in dollars and cents. (See Fig. 65.)

FIG. 64.—View of Valmora Industria Sanatorium, Watrous, New Mexico.

The Jewish Tuberculous Association of New York City has introduced an entirely new idea into the treatment of this disease. After years of combating tuberculosis among the Jewish people of New York they were impressed with the great economic waste which followed in the wake of this disease. During the perod of sanatorium care it was necessary to give large sums of money to maintain the family while the bread winner was absent. After his discharge from treatment months and often years elapsed before he could support his family. Investigation showed that most of these patients on

FIG. 65.—Tuberculous employees at work. (*Courtesy of Ford Co.*)

discharge from sanatoria were warned against returning to inside employment. They sought work on farms, as teamsters and at other outside occupations, positions for which they were untrained and physically unfitted. Jobs were frequently changed because they were not able to do the work. Exposure to the elements, worry and other undermining conditions caused a high percentage of recurrences.

In order to overcome this economic waste and unnecessary loss of human life this Association, through the magnificent efforts of Mr. Stein and Mr. Hockhauser, developed a postsanatorium factory. This factory is located in Hoboken, and is engaged in the manufacture of garments. Here under the best hygienic conditions, and constantly supervised by a competent doctor, over two hundred tuberculous employees have been given graduated work until they were finally

able to return to full time employment when they graduated from the factory. Tinsmiths, clerks, jewelers, junk men and many others have learned to be garment makers and are drawing larger salaries now than they made previous to their sickness. This factory has demonstrated that the garment industry when properly conducted is not a hazardous occupation predisposing to lung trouble. (See Figs. 66 and 67.)

The summary and chart—taken from a paper by Mr. Hockhauser on this experiment is one of the most enlightening contributions to all tuberculosis literature.

Fig. 66.—Model garment factory for tuberculous employees. (*Courtesy Jewish Tuberculous Association.*)

"An investigation in 1912 reported a waste of 45 per cent. due to relapse of sanatoria patients six months to one year after discharge. In a three year experiment we have reduced it from 45 per cent. to 15 per cent.

"The sanatorium treatment is but a part—a large part it is true—of the treatment of the tuberculous.

"After-care of the patient in his home is vital to any scheme which tries to conserve the gains made in the sanatorium and to protect the family from infection.

"Carefully selected patients can be treated at home with as good results as at a sanatorium. Some patients improve at home and at work even though they do not do well at an institution.

"To provide 'industrial convalescence' or a scheme of gradually returning patients to ordinary economic life we maintain a special factory where the doctor is the 'boss.'

"Over 90 per cent. of the families of the patients at the factory were under the care of relief agencies. Of 58 who received relief from three months to five years 17 are partially self-supporting and 41 are entirely self-supporting. Patients, whose families were granted from $40 to $80 a month by charities and relief agencies, are now earning from $60 to $160 a month.

Fig. 67.—Dining room in model garment factory for tuberculous employees.

"Periodic examination of the patient is the price of keeping the tuberculous at work. The doctor must know his patients to guard against the malingerer or the patient too anxious to work to be truthful.

Generous constructive care and supervision can cure dependency as well as tuberculosis."

All surgeons in industry as well as the tuberculosis worker have been impressed with this great waste of human energy as well as of human life and its resulting financial losses to the patient, his family and the state, which has been connected with the treatment of 4 tuberculous people. Not only is it essential for the states to provide adequate Sanatoria care for all tuberculous but it should see that these people are placed in proper employment and carefully supervised after their treatment ceases. The prevention of recurrences is equally as essential as the cure.

TABLE 16

PATIENTS NOW AT WORK AT POST SANATORIUM FACTORY

	Since leaving sanatorium	Since treated at home	Stage of disease			Present condition				Working							
										Half day or less, weekly earnings		Half day to six hours, weekly earnings		Six hours to full day, weekly earnings			
			I	II	III	App. cure	App. arrested	Inactive	Activity questionable	9.00 or less	9.01 to 15.00	9.00 or less	9.01 to 15.00	9.00 or less	9.01 to 15.00	15.01 to 25.00	25.00 to 40.00
							At factory 25 to 30 months										
Two to three years....	7	1	3	5	..	2	4	2	..	..	..	..	..	..	1	3	4
Three to four years....	10	..	5	5	..	3	6	1	..	..	..	..	..	..	2	5	3
Four to five years.....	1	..	..	1	..	..	1	..	..	..	..	..	..	..	..	..	1
Over five years........	1	..	..	1	..	1	..	..	..	..	..	..	..	..	..	1	
							At factory 17 to 24 months										
Two to three years....	4	1	3	2	..	..	5	..	..	..	..	..	..	..	1	3	1
Three to four years....	1	..	..	1	..	..	..	1	..	..	...	..	..	..	1		
							At factory 12 to 16 months										
One to two years......	6	1	1	6	..	..	6	1	..	..	..	..	..	..	4	3	
							At factory 2 to 12 months										
Three to twelve months	14	..	1	11	2	..	5	6	3	2	..	..	1	2	2	4	3
One to two years......	9	2	4	7	..	..	5	5	1	..	..	2	2	..	2	5	..
Two to three years....	1	..	..	1	..	..	..	1	..		..		..	..	1	..	
	54	5	17	40	2	6	32	17	4	2	..	2	3	2	14	24	12

Of these 59 patients, 54 are sanatorium graduates and 5 were treated at home. 42 patients are in the advanced or moderately advanced stage of the disease and 17 are in the first stage.

The establishing therefore of industries in certain centers where these ex-sanatoria patients could be sent for graduated employment under proper medical supervision is a duty which should no longer be neglected. Those states which are providing sanatoria for the tuberculous should at once provide these state industries where they can work until such time as it is safe for them to return to private employment (F g. 68).

It is a fallacy to recommend outdoor employment such as farming for all arrested or apparently cured tuberculous patients. Many of

Fig. 68.—Every state should provide these model factories for the tuberculous in connection with the state sanatoria.

these are not vocationally trained or physically fit for the strenuous outside work and to others it is abhorrent. Experience in caring for the tuberculous employee has proven that the majority of these can return to their former occupations providing there are no known hazards connected with it.

Society owes an everlasting debt of gratitude to those industries which have provided the means of Prevention, Discovery and Treatment of the Tuberculous Employees.

CHAPTER XXX

RECLAIMING THE TUBERCULOUS SOLDIER FROM THE MILITARY AND INDUSTRIAL ARMIES

The army is a great military industry made necessary by the present struggle of right against might. Its medical problems are very similar to those found in the industrial army. The solution of these problems for the soldier is destined to carry over into civilian life. Therefore, in considering the reclamation of the tuberculous at this time it is only logical to deal with the entire man power in both armies.

The war has brought to public attention a great many disabilities which overtake the soldier as the result of military service. Some of these disabilities and our efforts to overcome them are in the limelight more than others. Thus, the reconstruction of the badly crippled, the deformed, and those suffering severe facial disfigurations, is wonderful and quite spectacular to the general public; the retraining of the limbless and of the blind likewise appeals to our minds and imaginations. But just as wonderful work is being done for those soldiers disabled because of disease and the number of these far exceeds those who are crippled or blinded.

These same disabilities existed before the war, but the busy public paid very little attention to them except when they or their friends were the victims.

But our efforts to prevent disease among the soldiers, and when disabilities overtake them, to reconstruct, and when necessary retrain them for a life of usefulness, are gradually awakening the public conscience to the need for the same efforts among the civilian disabled.

The disease which is causing the most disability among the soldiers of all the nations is tuberculosis. We have not been in the war a sufficient time to realize the terrible ravages of this disease among the military and civilian forces alike, but the experience of our allies is sufficient warning to point out the importance of our preparing to combat tuberculosis and its complications.

It is difficult to obtain exact statistics concerning the incidence of tuberculosis in the warring nations. A conservative estimate recently made by one of our greatest tuberculosis experts, Dr. Briggs, who studied conditions at first hand in Europe, showed that there are at least 500,000 active cases of tuberculosis in France. England

shows an increase of 16 per cent. in the death rate from pulmonary tuberculosis as compared with the rate of 1914.

The Canadian forces have already sent 2500 cases of tuberculosis back to the sanatoria in Canada for treatment. Fifty per cent. of these were discovered among the soldiers before they had been sent overseas.

Many cases of tuberculosis have been discovered among our own soldiers. The epidemics of measles, grip and pneumonia which have been so prevalent throughout the cantonments, will increase the tuberculosis rate materially.

In the light of the above facts and figures it is imperative that the plans of the medical department of the army be formed along three distinct lines: prevention, reclaiming, and coördination with civilian plans.

As a result of the work of the National Tuberculosis Association during the last fifteen years the national conscience has been stirred, the public has been educated to means of prevention and cure of tuberculosis, and the soil has been generally prepared. A great harvest of results awaits the reapers.

In addition to this publicity and missionary work almost every large city of the country now has its tuberculosis institutes, many county institutes have been formed and much valuable machinery in the way of medical experts and visiting nurses has been established for the purpose of fighting this disease. A number of municipal and state sanatoria have been erected. A few states like Massachusetts have made elaborate plans for a sanatorium in practically every county or group of counties and have many of these in operation. Large appropriations by some of the states have been made.

Meanwhile, the medical profession has made great advances in the treatment of this disease. No longer is it considered fatal. No longer do we think it necessary to send the tuberculous patient out west or far from home in order to accomplish a cure. Homesickness and want have ceased to be the great allies of Death in treating these cases.

Climatic treatment, many different drugs and serums, and other specifics have come and gone during these years. Theories as to modes of infection and as to the spreading of infection have been advanced and discarded, and some remain for the proverbial bone of contention. Absolute rest for months has been advocated by some, and early exercise and work is the criterion of others as adjuncts to various forms of treatment.

But a few sound, common sense principles have been evolved and have withstood the acid test of time and criticism, and will remain as the fundamentals in our crusade against this disease. These are:

1. Prevention.
   (a) By combating unsanitary home and working conditions, child labor, inadequate food, alcoholism, and venereal diseases.
   (b) By preventing the spread of the disease from one infected person to another.
   (c) By active and thorough treatment of those respiratory diseases predisposing to tuberculosis.
2. Diagnosis.
   (a) The importance of an early diagnosis.
   (b) The value of the periodical medical examination as a means of early diagnosis.
   (c) The importance of medical examination of other members of the family when a case is discovered.
3. Treatment.
   (a) The instituting of early sanatorium treatment.
   (b) The value of isolation of the case from free intercourse with society.
   (c) The established routine of Rest, Fresh Air, Proper Diet combined with graduated exercise later on.
   (d) The importance of supervision of the apparently cured case for many years.

All of these things with many additional details the tuberculosis expert and his lay and nurse assistants do to-day. The treatment laps over into the social and economic field. Thus, the tuberculosis institutes, and other groups of workers in this field, have banded together to efficiently handle the medical, social and economic aspects of this disease. They treat not only the individual but society at large.

A wonderful work has been accomplished by these organizations all over the country but the surface has only been scratched. Their cases have come to them voluntarily or been referred by charitable organizations. The weakness of the system has been the absence of some form of governmental control—federal and state.

The discovery of approximately two hundred thousand cases of tuberculosis among the first ten million men between twenty-one and thirty-one examined for the draft army showed the enormity of the task before us. Thousands upon thousands of young men have been thrown back into civilian life suffering from tuberculosis. Some have been referred to the proper authorities for treatment, but many remain loose in society to combat the disease according to their individual desires—sources of infection to their fellowmen. What an economic waste of man-power in this day when man-power is at such a premium.

Therefore, the first contact that should be established and cemented most firmly between the military and civilian forces is apparent—*the reporting of every man rejected from the army because of tuberculosis to an authorized civilian agency.*

This agency must provide in every state suitable sanatoria and proper medical attention for the treatment of these cases until cured. The state should make such a course of treatment compulsory. The mistake of our allies in allowing them to go untreated, spreading the infection to others, must not be repeated by us. Such a mistake has already been made but it is not too late for correction.

For years we have dreamed of a nation striving constantly to prevent tuberculosis. We have dreamed further of an elaborate system, of sanatoria scattered throughout the nation for the cure of these cases. To-day the demand for the conservation of our man-power makes it absolutely essential that our dreams become realities.

This is a national emergency and all things looking to the winning of this war, either by sacrifice or by saving, can be established now. This is the time to get together and do it.

All tuberculosis associations should coöperate with the United States Public Health Service, the National Defense Council, the American Red Cross, the organized medical profession, and all other agencies capable of contributing to the effort, and institute a great drive against tuberculosis now rather than two years hence when the increased number of cases will force cognizance of conditions as it has done in France and England.

There is still another civilian force that has been doing excellent work in the tuberculosis field— a force that has made itself felt more and more during the last decade in both the medical and economic world. I refer to the industrial physicians and surgeons of the country. Not the oldtime company doctor who constantly thought of the interests of the employer alone, contenting himself with the emergency surgery that arose in the plant, but the new industrial medical man who speaks the language of preventive medicine and preventive surgery, who is the employees' physician, and who has become a great efficiency expert for the employer by constantly thinking of the interest of the employee.

About ten years ago the medical examination of employees became a fixture in a few industries. Gradually it became apparent that for the protection of the old working force and for the new workmen alike the examination of all applicants for work must be included in this system of health supervision.

Whereas, ten years ago only three or four industries in the country had established some system of health supervision, the foundation

of which is the medical examination at stated intervals, to-day we see a very comprehensive and thorough system in operation in at least one hundred industries and approximately five hundred concerns have inaugurated some health system.

It is impossible to estimate the results of the work of these surgeons upon the health of the industrial workers of the land. Neither can we say to what extent the death rate from both accidents and disease has been reduced by their efforts. But that the results have been immense is a certainty.

I have obtained the figures from ten industries where the best form of Industrial Medicine and Surgery is practised, where the medical examinations are thorough and complete and where careful statistics of results are kept. These figures show that last year 104,066 employees were given medical examinations; that during the last five years 276,420 employees have been examined thoroughly. Some of these industries have examined their workers only during the last year, while others have had the system in force for the entire five years.

During these five years examinations have resulted in the discovery of 4423 cases of tuberculosis, or 1.6 per cent. of all examined had the disease. Approximately one-third of these were cared for by the industries where they were employed.

With a hundred industries carrying on a comprehensive system of Industrial medicine to-day it is conceivable that during the next five years 27,642,000 physical examinations of employees may be made and 442,300 cases of tuberculosis discovered.

If the states will only provide adequate sanatoria care for these cases, the greatest advance will be made in eradicating this greatest plague of humanity.

The Industrial Surgeons' Committee of the Council of National Defense has proposed a program for the complete supervision of health of the industrial army during this crisis through which the nation is now passing. Recognizing that the industrial army is of equal importance to the military army in winning the war, this committee is endeavoring to devote its energies to keeping the standard of health at the highest level among all workers in the industries necessary to the continuance of the war in order to keep production up to the highest mark.

Healthful workers are as essential to production as the most effective machinery—both must be supervised. To attain these results the committee proposes to establish in all industries the following program:

1. Supervision of physical condition of employees by medical examinations.

2. Industrial sanitation.
3. Sanitary home conditions.
4. Prevention of disease.
5. Prevention of accidents.
6. Early and proper medical and surgical treatment when needed.

To carry out this program the industries must not be depleted of physicians. Other medical men must be persuaded to enter this field. By concentrating upon a large group of people in this way the doctors can supply the demands of the civilian population much more efficiently, which is very desirable at this time when so many of our profession are in the army.

In addition to this force of physicians the committee intends to secure the greatest co-operation between the United States Public Health Service, the Department of Labor, the state and municipal health departments, and all other agencies which must be depended upon to do a part of this great work.

It is hoped, and there is reason to believe, that the federal government will throw its influence behind this movement in order to have the war industries at least adopt this program. This is one of the greatest war measures that has been undertaken during this national emergency.

With such a system of health supervision established in industries throughout the country, millions of people will be given periodical medical examinations and thousands of cases of known and unknown tuberculosis will be found. Experience in this line of work has proven that over 85 per cent. of these cases will still be in the curable stages.

What will become of these tuberculous Industrial Soldiers? How will the civilian forces handle them? What provisions have the states made to adequately treat these cases? How will the Federal Government meet the problem?

By co-operation and co-ordination the medical department of the army and the various civilian agencies can meet this situation. God grant that we may arise to our opportunity!

The immediate problems for the civilian forces are:

1. Providing in every state several sanatoria where these cases can be treated.
2. Laws making sanatorium treatment compulsory until the disease is arrested.
3. Co-operation with the Industrial program in order to discover the tuberculous employees.
4. Co-operation with the machinery of the army to have the tuberculous draftee referred to the proper civilian authority.
5. A National program of Health Supervision carried on along lines similar to the Food Conservation work, whereby the

entire population of the country would be induced to enter into a great, common-sense health movement, as a patriotic duty. This could be accomplished by an educational campaign which has the moral and financial backing of the Federal government. The medical examination of everybody could be made a fact, and the correction of the diseased conditions would naturally follow.

The present tuberculosis problem has been facing the medical department of the army for over a year now. Those found at the draft examination with this disease and even many of those discovered within three months after induction into the service have been thrown back into civilian life. Unfortunately only those cases which were found at the examination at the cantonments were referred to civilian authorities. Some of the states have provided for the care of these but others have failed to meet the problem.

The first great advance in the army program was made the first of this year (1918) when the Surgeon-General issued an order that all cases of tuberculosis found at the cantonments after the men had been inducted into the service would hereafter be considered "in line of duty."

This stopped the discharge of many of these cases. Sanatoria treatment was offered to all regardless of "line of duty" or not, but refusal to accept it meant their discharge. For those in line of duty the War Risk Insurance Bureau took up the case and arranged for compensation. The treatment was left to the individual's desires and arrangements. Any of these line of duty cases could apply for treatment in one of the army sanatoria if they so desired. This was not generally known by the men, however, and the busy army doctors did not always take the opportunity of urging sanatorium treatment to them. In 1918 the War Risk Insurance Bureau through the United States Public Health Service arranged for sanatorium care for many of these discharged cases.

About nine months ago (August, 1917), the Division of Physical Reconstruction and Rehabilitation of Disabled Soldiers was organized in the Surgeon-General's Office. The purpose of this Division was to provide the machinery for completing the cure of certain types of disabled soldiers returning from overseas and arranging for their re-ëducation and vocational training when it was necessary for them to learn a new occupation because of the nature of their disability.

At first it was thought this work would be limited largely to the surgical cases, especially orthopedic and severe facial disfigurements. Gradually the plans for Physical Reconstruction have unfolded, however, until to-day it includes every type of medical or surgical case requiring prolonged treatment, and instead of referring only to

the disabled from overseas, all cases in this country or from the expeditionary forces abroad are included in its scope. It is realized now that the tuberculous patients will make up a large proportion of those needing reconstruction and in many instances vocational retraining.

In December, 1917, and again in January, 1918, a new policy was submitted by the Surgeon-General to the Secretary of War for his approval. The Army Regulations provided that when a soldier was unfit for full military service he was to be discharged from the Army. Medical and surgical treatment was rendered to these men but often they were discharged before a cure had been accomplished.

This new policy, however, provided that in the future no disabled soldier should be discharged from the Army until from a physical, functional and mental standpoint he had been cured as far as it was humanly possible. It further provided that the medical department of the army should employ all therapeutic adjuncts necessary to attain such a result, including physiotherapy, bedside occupations, and curative therapy in workshops.

This policy was approved by the Secretary of War the first of May, 1918.

This will prove to be one of the greatest advances ever made by the medical department of the army and is another notable achievement of our illustrious chief, General Gorgas. The far reaching results of such a policy are only vaguely comprehended by the majority of men as yet. It means the death knell of our old soldiers' homes where disabled men in the past have been prematurely relegated to the scrap heap.

To complete this process of reclaiming the disabled soldiers Congress is providing the machinery for their vocational retraining when necessary, assistance to complete their educations, replacing in occupations where they will have as great or a greater earning capacity than before they were handicapped and the proper social and economic supervision to see that their rehabilitation is completed and so remains. This portion of the work will undoubtedly be delegated to the Federal Board for Vocational Education after the man is discharged from the army. Co-operation between this civilian agency and the medical department of the army will enable much of this vocational training to begin during the final stages of the man's convalescence.

Already the War Risk Insurance Act has been placed in operation and it provides excellent compensation for these men—a compensation based upon a debt which the nation rightfully owes her disabled soldiers and not given to them as a charity. No matter how proficient these men become as the result of vocational training, this compensation will not be reduced.

The tuberculous soldier is included in this far reaching plan as well as all other types of disabilities. Sanatoria are being established in various parts of the country where these tuberculous soldiers can be sent and retained until cured. The order has already gone forth making it compulsory to send all cases of tuberculosis to these sanatoria, both from the home and expeditionary forces before they are discharged. Some will demand their discharge on arriving at the sanatorium and will bring political influence to bear to secure it. But the majority will be subtly persuaded to remain until their disease is apparently cured. The prolonged course of treatment necessary for these men will enable many of them to be vocationally trained for better positions in life before they are discharged.

Now that the army has provided this improved arrangement for the tuberculous soldier it behooves the civilian forces to make equally elaborate preparations for the physical reconstruction and rehabilitation of the tuberculous industrial soldier and in fact for all civilian tuberculous patients. This can only be accomplished by federal and state provisions for the discovery of these patients and the necessary sanatoria for their treatment. Combined with this must be a nationwide educational campaign to arouse public opinion in favor of such a program.

The treatment of both the military and civilian tuberculous should be for the combined purpose of accomplishing their complete physical and mental cure. Instead of returning them to their communities as hospitalized individuals they should be returned as more useful economic units of society. This can be attained by introducing curative work and vocational training into the routine sanatorium treatment.

The following outline is a suggested plan for the physical reconstruction and rehabilitation of the tuberculous from both the military and industrial armies.

In reclaiming those in the military and industrial armies who have contracted tuberculosis and in securing their complete rehabilitation, the following requirements must be considered:

I. The best medical treatment with certain adjuncts to secure the most rapid recovery.

II. Certain occupations in connection with this treatment, to prevent hospitalization and to refit for employment.

III. Suitable employment after the disease is arrested or apparently cured, combined with proper medical supervision

I. The best medical treatment with certain adjuncts to secure the most rapid recovery.

A. Prevention.

1. By periodical physical examination to discover early signs of the threatened disease.

2. By prompt and proper medical care of all colds, grippe, bronchitis, pneumonia, and other respiratory diseases.
3. By proper care of certain complications predisposing to tuberculosis which remain after these act ve diseases are cured. For instance, pleurisy following grippe and pneumonia, or the small patches of unresolved pneumonia following the latter disease predispose to tuberculosis.

B. Sanatoria Care, Medical Treatment and Adjuncts.

1. When tuberculosis develops, the case should be sent to a sanatorium at once.
2. The medical care should be under specialists in tuberculosis work.
3. During the active stage when temperature, weakness, and aggravated symptoms demand absolute rest in bed, the men should be entertained, but all mental and physical work should be barred.
4. Light mental and physical work can become an adjunct to the medical treatment when the patient reaches the stage of treatment which permits his sitting up in bed or spending a few hours in a reclining chair on the porch.

   a. Purposes:

   1. To stimulate hope and desire for recovery.
   2. To occupy patient's mind, to remove his thoughts from his disease, and all outside worries. Encouraging reports from home that his family is all right and being properly cared for are essential to help put patient in proper mental attitude.
   3. To gradually prepare him for a more elaborate course of study and work as soon as his condition warrants.

   b. Types of Mental and Physical Work:

   1. These must be arranged after a careful study of each individual with a view of accomplishing the purpose desired.
   2. The studies should be arranged along the lines of the man's former occupation, with the idea of making him a better employee or employer. For instance, if a farmer, his studies should be along the lines of agriculture. If he were a dry goods clerk, his studies should be the "textile industries," the "manufacture of silks and dress goods," "business management," "human engineering," etc.
   3. Most cured tuberculous cases can return to their former occupations, except those employed in dusty work, as coal miners, certain types of packers, etc.;

in occupations with disease hazards, as lead workers, phosphorus workers, etc.; in jobs with great exposure to elements, combined with heavy work, as teamsters. *For these there must be training in new occupations.* Here again the individual equation must be carefully studied. After the man has decided what line of work he intends to follow, his studies should be along that line.

4. Light occupations should be provided for these bed and chair patients as soon as their conditions warrant. (1) Embroidery, pottery, light jewelry, and the usual arts and crafts work commonly employed heretofore are not practical nor appealing to the average man. They may well be used for the female patients. (2) Curative work should always be made of the most practical character.
5. Examples of light work:
   - (*a*) Knitting socks, wristlets, sweaters, etc., not by hand, but on the light machines now provided for this purpose.
   - (*b*) Making dressings for hospitals.
   - (*c*) Making various kinds of splints.
   - (*d*) Wrapping armatures. Arrangements can be made with nearby electrical concerns to have this done by piece-work.
   - (*e*) Sign painting.
   - (*f*) Typewriting and learning shorthand.
   - (*g*) Toy making by hand.
   - (*h*) Book binding
   - (*i*) Careful analysis of light occupations will reveal many more with a practical trend.
6. Moving pictures, lectures, and other forms of entertainment, both amusing and instructive, must be combined with this medical, mental and occupational therapy, as a definite part of the cure.

II. Various studies, heavier and more continuous occupations, and retraining for work.

After the patient's disease becomes quiescent and his temperature remains normal, and his strength returns; and in the opinion of the physician the patient can have a certain number of hours of exercise per day, his course of study can be increased and he can be permitted to do heavier work.

When necessary to retrain for new occupations, this can now begin. The doctor must at all times decide the number of hours of study

and work which it is advisable for the patient to pursue. This must be increased and decreased according to the patient's daily condition.

A. Purposes:

1. Same as purposes for lighter occupations and study, plus.
2. To prevent laziness, dependence, and hospitalization so prevalent in all sanatorium treatment.
3. To refit for employment in his old or a better position than he had previous to the war.
4. To increase productivity and earning capacity.

B. Types of Study and Work:

1. His studies started during his earlier days can be continued, increased, and supplemented by classroom work and by special lectures and note-taking.
   Lectures in almost any line of study can be procured gratis from our large industrial establishments.
2. His work can now be increased to give productivity and wages; and thus develop a sense of independence and usefulness.
3. Examples of occupations:
   a. Carpentry.
   b. Mechanics—especially acetylene welding, lighter motor mechanics, inspector work, as of small shells, and other lines, especially valuable for war industries.
   c. Agriculture—bee husbandry, poultry raising, stock raising, gardening, and lines suitable to those who were farmers and to the *few* suitable cases who will be retrained for farming.
   Every sanatorium should have its own poultry yards, bee hives, and dairy, and these can be utilized for teaching purposes.
   d. Tailoring—this work is especially fitted as a form of occupation for the tuberculous when he can first begin to return to work. It is not heavy, can be performed in airy rooms, is done by machines, for the most part easily manipulated, and pays good wages. Every sanatorium could make suits and uniforms for our soldiers and sailors, such as are being made by the factory in New York which is run by 150 arrested tuberculous cases.
   e. Shoe repairing: Old shoes from the army could be sent here for repair, which would give productivity and wages.
   f. Commercial work should be provided.
   g. Every occupation represented by a patient should be

represented in some way at the sanatorium to improve the patient along his line of work.

h. The idea that all tuberculous cases after leaving a sanatorium must return only to outside work is erroneous. With very few exceptions they can return to their old employment. Therefore, our idea should be to improve their condition by education, by a broader insight into their work, and fitting them to advance into better positions.

III. Suitable employment after the disease is arrested or apparently cured combined with proper medical supervision.

A. No tuberculous patient should be discharged from a sanatorium until the disease is arrested or apparently cured. In some cases this may mean two years or more of sanatorium treatment. However, if he is discharged before this goal is obtained, the benefit of his sanatorium treatment may be lost. Exceptions may have to be made to this rule, but as a general principle this standard should be adhered to. In some cases arrangements for suitable work under medical supervision can be made, thus allowing the cure to continue while the patient is earning part or all of his living. State industries should be established for this purpose in connection with state sanatoria.

B. These men should be placed at work under the best sanitary conditions possible. If their old jobs were in unsanitary plants, sweat-shops, etc., similar jobs should be secured for them in suitable working places.

C. Definite arrangements should be made whereby these patients will have medical supervision and periodical examinations, in order to make sure that their disease remains arrested and continues into a permanent cure.

The effective plans for the salvaging of the tuberculous from the military army should awaken us to the immediate need of reclaiming the tuberculous from the industrial army and from the entire civilian population. If we arise to our obligation and strive to conserve our manpower in this period of national emergency, the result will be one of the greatest and most beneficial by-products of this terrible war.

Part IV
INDUSTRIAL SURGERY

CHAPTER XXXI

THE SURGICAL DISPENSARY, STAFF AND EQUIPMENT; PREVENTIVE SURGERY

The physician engaged in accident surgery for an industry is naturally trained, by the very character of the work, to view every case from its economic standpoint. An accident occurs, and at once he plans the subsequent treatment with four fundamental principles in mind:

1. How to aid recovery the quickest.
2. How to prevent permanent disability.
3. How to avoid a fatal termination of the case.
4. How to prevent a recurrence of the accident.

The welfare of the patient, the protection of the other employees, and the interests of the employer, all demand the careful consideration of these principles.

Unfortunately such a conception of accident surgery did not obtain until of recent years. Like the man in Robert Burdette's lecture, "Acres of Diamonds," our best surgeons were seeking the newer and rarer conditions in other fields while the real, constructive surgery, ever present in their midst, as the result of accidents, was more or less neglected.

But more and more during the last ten years expert surgeons have been attracted to this field of industrial surgery and their writings and teachings are awakening the profession to its duty in regard to the careful treatment of the victims of accidents. With the enactment of compensation laws greater demands have been placed on the surgeon by industry, by the employees, and by the legal profession. He is frequently forced to give a prognosis of the expected results and occasionally the line of treatment adopted by him is reviewed and criticised by others before the compensation board. Not only must the injured part be cured, but it must be functionally restored so that the patient can again become a productive unit. If such a result

is not obtained, then a very definite reason for the failure is often demanded by these lay forces.

These facts have caused all surgeons, and especially those engaged in industrial surgery, to recognize more fully their responsibility toward the accident cases. They are thinking less of the surgical end-result and more in terms of the economic end-result.

Industrial surgery consists in the prevention and treatment of all injuries, the result of accidents, arising in the course of employment. These are usually divided into minor and major accidents. The subject can best be treated under the subheads of: (1) Preventive Surgery; (2) First Aid; (3) Emergency Treatment; (4) Subsequent or Permanent Treatment.

Before entering into a discussion of these subheads, consideration should be given to the necessary arrangements for the proper care of accident cases in industry.

The Surgical Staff.—Industrial surgery, in its best, most complete interpretation, is now based on the principle of *bringing the surgeon to the injured instead of the injured to the surgeon.* In other words the surgeon must be constantly *on the job* in industry to render immediate and proper treatment to all injured employees. This principle is the greatest advance which has been made in accident surgery during the last decade. Moorhead, Corwin, Clark, Hudson, Farnum, Mock, and other surgeons in industry, and Bloodgood, Edward Martin and others, have emphasized this point at every opportunity.

For adequate treatment of injured employees every industry should provide the services of a qualified surgeon. The smaller plants cannot perhaps afford to keep a surgeon on the premises at all times and the best plan for them, therefore, is to combine with others for the employment of a surgeon. A central office in the neighborhood of several industries, at which a surgeon is always in attendance, affords the best solution for these smaller concerns. Well trained assistants must be instructed to render the necessary first aid care.

The large industry, especially if accidents are frequent, should have a surgeon near at hand at all times so that prompt care can be rendered. Three plans may be adopted to meet the situation, namely:

1. The doctor should spend a part of each day at the plant dressing the minor cases which report to the doctor's office, and caring for the injuries that may arise during this period. After two or three hours he leaves the plant to visit the major accident cases in their homes or at the hospital. He may care for the injured employees in one or two other plants by a similar arrangement. He must keep the plant posted at all times concerning his whereabouts. An associate must be arranged for who can respond to an emergency call when he cannot.

During his absence from the plant a well trained first aid man, or preferably a nurse, should be in attendance to render emergency care to any injured. This person must develop clear judgment as to when to call the surgeon or when to send an employee to his office, or to the hospital, to see him.

This plan is in force in many industries and gives fair results. It is indeed, a great improvement over the old method of leaving an injured employee without any care until some doctor—any doctor—could be summoned, or until the ambulance could be called and the injured party sent to the hospital.

2. The second plan consists of employing an all time physician who remains constantly at the plant during working hours giving immediate emergency treatment to all injured employees and attending to the daily dressings of the ambulatory cases. The major accident cases are sent to the hospital or to their homes under the care of some other surgeon. Usually the management arranges with this surgeon to treat these major cases, which is preferable, or the injured employee, or his family, chooses the doctor he desires.

As a rule such company surgeons become expert at emergency care but are not qualified to carry the treatment of serious injuries through to their completion.

This plan has been in vogue in many of our large industries for years. It has given good results but not the results obtained by placing the full responsibility for the best and quickest possible cure on the surgeon connected with the industry.

3. The third plan is more often found in those plants employing part time surgeons but it is also applicable, and in use, among the full time surgical staffs when two or more doctors are employed. One physician, the surgical assistant, is thoroughly trained in emergency treatment and the subsequent dressings of all injured employees reporting to the plant dispensary. The chief surgeon spends a part of his time at the plant supervising the emergency work, as well as all the other angles of the industrial medical practices. The remainder of his time is spent at the hospital and at the homes of injured employees rendering the necessary permanent treatment.

In the part time staff such a surgeon usually has time to teach and develop a private practice. He has two surgical assistants each spending a half day at the plant. I always insist on one of these living near the plant so that he can quickly be called at night in case of an accident. Where a large night force is employed a surgeon should be on the job all night.

This third plan, involving as it does the combination of an experienced emergency surgeon at the plant at all times, and the supervision of all the work and the permanent care of the major accidents by

another qualified surgeon, has given the best possible results in industrial surgery.

Every industry employing men or women in work where accidents are prone to occur should adopt one of these systems. The best plan necessitates the employment of good surgeons at all times. *Cheap surgery usually gives poor results.* Employers will find that expert surgery, while costing more in the beginning, is by far the cheapest method in the long run. Such surgery will reduce law suits, lessen compensation, and add greatly to the loyalty and confidence of the employees.

Surgeons employed by industry must become thoroughly imbued with the fact that proper treatment rendered immediately after an

Fig. 69.—Surgical room for men. (*From Doctor's Office, Sears, Roebuck & Co.*)

accident occurs is one of the greatest principles of *preventive surgery,* surpassed only by the prevention of accidents. They must study the local situation so that someone absolutely qualified to give this immediate treatment is always close at hand. Theirs is one of the most responsible positions in the medical profession.

The surgical nurse is the most valuable assistant the surgeon in industry can have. Some employ a male nurse for this position but I have found a well trained, carefully uniformed female nurse is a more efficient assistant. Her presence, if she is adept, conscientious and tactful, adds to the confidence of the employees and increases the morale among them when they visit the office.

This nurse should remain in the plant dispensary continuously during the working hours. She should be thoroughly trained in her relations to emergency surgery and able to take charge of a case and render first aid care until the surgeon arrives if he should be absent from the plant. Such nurses become quite skilled in this work and

undoubtedly have saved the lives of employees in more than one serious case.

The nurse sterilizes the dressings and keeps a supply on hand at all times. She keeps the instruments sterilized and ready for immediate use. She prepares the patients for minor operations performed in the plant dispensary and assists at these operations. In fact she is a versatile operating room nurse and surgical dispensary nurse combined.

In one plant dispensary where an average of one hundred injured employees received emergency treatment or reported for subsequent dressings daily between the hours of 8 A.M. and 12 noon, one emergency surgeon and two surgical nurses were able to efficiently handle this work. Miss Mabel Liddel, one of the pioneer industrial surgical nurses of the country, was largely responsible for developing this system.

Just outside the surgical room a girl clerk was stationed. As the employees left she collected their passes and recorded on their permanent records the penciled notations made on the passes. Histories of new accidents were obtained and recorded in the same way. The doctor questioned every new accident case carefully and brought out all important points which would help in preventing the recurrence of a similar accident. (See Chapter 12 for records of Accident Cases.)

This clerk kept a tickler system on each employee and if he failed to report promptly at the designated hour for his dressing would phone to the department and have him sent to the office. Occasionally it happened that an employee remained at home because of his injury without notifying his department or the doctor. This tickler system enabled the detection of all such cases. One of the surgical nurses would call on the absent employee in the afternoon and either bring him to the office for treatment or would summon the surgeon to his home. This constant watchfulness is necessary to prevent complications developing in these accident cases, as employees are frequently careless about their dressings or prefer to try some home remedy, as a bread and milk poultice, thus adding greatly to the danger of infections.

The Surgical Office.—Every plant of sufficient size to warrant a doctor's office should set aside one room for the surgical cases. It is unsightly, arousing fears in the employees, if the sick and those reporting for examinations must witness the dressings of the injured. Furthermore such an office should be kept as clean and as aseptic as any operating room. This is often difficult where workmen must report in their dirty, greasy working clothes, but nevertheless cleanliness can be maintained even under these conditions.

Where women are employed a separate surgical room should be provided for them, or if only one room is available, men should

be barred while an injured woman employee is receiving her dressing, even though it is only an injured finger. As much segregation of the sexes in the doctor's office must be maintained as possible. The more nearly conditions can be made to correspond to a well regulated private office the better, for only in this way can the absolute confidence of the employees be secured.

The office should be well lighted, well ventilated, and kept as free from drug and wound odors as possible. The walls should be white enameled and the floors made preferably of tile or of one of the cement-like preparations so commonly used in hospitals. Cracks and other places where dust can collect must be obliterated. The furniture and equipment should be of white enamel.

Fig. 70.—Surgical dressing room for women.

Instruments, especially knives and other terrifying paraphernalia, should be kept out of sight. The same is true of bloody or pus-saturated dressings which have been removed. These should be thrown in a can covered with a lid which can be raised by a foot pedal. When a wound which may appear frightful to others is to be dressed the office should be cleared of all other patients. Too much attention cannot be paid to these details which, if not observed, tend to have a bad reaction on the employees.

The *equipment* of this office should be simple but adequate. The various illustrations show the ideal arrangement in some surgical dispensaries in industry. It should consist of:

1. A stationary wash stand with hot and cold water faucets with a foot pedal control.

2. A stationary foot tub and another for hand or arm baths. These facilitate the work greatly as many cases will need a prolonged hot bath for some sprain or chronic infected part.

3. At least two basins in a rack should be provided for hand solutions for the use of the surgeon.

4. One or more white enameled chairs, depending on the size of the room and number of patients accommodated at one time.

5. One white enameled stool on which the patient can sit while he rests his arm on a table for hand dressings.

6. One or more white enameled foot stools of sufficient height to facilitate foot dressings.

7. One white enameled surgical table for the patients who must lie down for treatment. This table will often be used for patients showing signs of fainting.

8. One reclining chair, somewhat similar to a dentist's chair, for use in eye injuries, especially in removing foreign bodies from the eye.

9. One small dressing table for use in hand and arm cases.

10. One white enameled, glass topped table on which instruments, jars containing sterile dressings, bandages, medicines and other things needed in the dressings of all kinds of cases can be placed.

11. One instrument cabinet.

The number and type of instruments must be determined by each surgeon according to the local needs.

All of the above equipment may not be needed in many plant dispensaries while others may need a more elaborate equipment. This, however, forms an average for most surgical offices.

Sterilizing Room.—As an adjunct to every surgical dispensary in industry there should be a well equipped sterilizing room. This should consist of at least one large steam sterilizer for the sterilization of all dressings and one instrument sterilizer. The rubber gloves worn by the surgeon, the basins for solutions, the dressings and instruments and in fact everything coming in contact either directly or indirectly with the injured parts should be as scrupulously sterilized as when used in an operation. In a well organized office this can be done without any undue loss of time.

Dressings, Supplies and Bandages.—Surgical gauze should be used for the dressing of all open wounds. Absorbent cotton which is at times applied by some is not suitable because of the difficulty of removing this after it has become adherent to a wound.

I have found the following procedure the most economical and most efficient in preparing dressings for at least a hundred cases per day.

1. Surgical gauze is bought by the bolt.
2. Nurses cut this into different size dressings:
   (*a*) Small, three layer piece of gauze for finger dressings (1″ by 2″).
   (*b*) Slightly larger, three layer piece of gauze (2″ by 4″) for

hand dressings, or for small wounds about the head or other surface of the body.

(*c*) Three layer, folded piece of gauze (4″ by 6″) for the larger wounds.

(*d*) Four layer, rolled piece of gauze (4″ by 10″) suitable for encircling the arm or covering considerable surface of the body.

(*e*) Large hemorrhage pads consisting of cotton covered with two layers of gauze folded with edges turned in (6″ by 10″).

(*f*) Larger hemorrhage pads (12″ by 18″) made about two inches thick for use in severe crushing wounds or to cover a stump where the limb is completely severed.

3. Each of these dressings is rolled separately in a piece of thin paper carefully twisted at either end so that the dressing is completely and thoroughly covered.

4. These are then placed in a small sack the size of a ten pound meal bag and put in the sterilizer for one hour.

5. These sterile dressings as needed are put in large covered glass jars kept on the dressing table. In using them the nurse or doctor tears off the tissue paper, unrolls or unfolds the dressing without touching the portion which goes next to the wound and lays it over the injured part. All dressings in the first aid kit are similarly prepared.

Towels, cotton tampons, sponges and similar materials are also covered with paper and sterilized.

Basins are put in cloth bags which are then carefully tied with draw-strings and sterilized in the same manner.

Rubber gloves are rolled in pieces of cloth and sterilized.

Bandages are among the most expensive items in the dispensary if bought already cut in 1″, 2″, 3″, etc., sizes. Very good gauze bandages can be obtained in long, solid rolls, wrapped in paper, and cut as needed with a knife into the various sizes. Strong cotton bandages are also necessary especially in applying splints. Flannel bandages are used frequently about swollen joints or as supports in varicose veins of the leg. All of these materials can be bought in bulk and the nurses can cut and roll the bandages in the sizes needed.

Cotton applicators play a very important part in minor surgery about an industry. Iodin is best applied to surface wounds by means of these applicators. Also applicators and a bottle of iodin should be placed in every room about the plant so that employees can paint iodin on their wounds at once. These applicators are made by rolling a small piece of cotton on the end of a toothpick.

Adhesive plaster is used extensively in dressing injured parts. This should be bought in bulk, rolls 14″ wide and approximately three feet long. The small strip used so commonly to hold bandages in

place, or often to replace bandages, can be cut and stuck to a piece of glass the size of a window pane, thus being quickly available for use.

Employees with minor injuries, not sufficiently serious to prevent their working, can have their efficiency greatly increased or diminished by the type of dressing that is applied. This is especially true in injuries about the hands. Often one sees a small cut on a finger bandaged until the whole hand and wrist are encased. The psychological effect of such a dressing on an employee is bad. Therefore the smallest possible dressing should be applied and a minimum amount of bandage used to hold it securely in place. As few joints as possible should be restricted by the bandage.

Wire cages or protective strips of tin are very useful in protecting injured fingers and adding to the comfort and efficiency of the employee. These are placed next to the sterile dressing and held in place by a bandage or adhesive plaster. (See Fig. 71.)

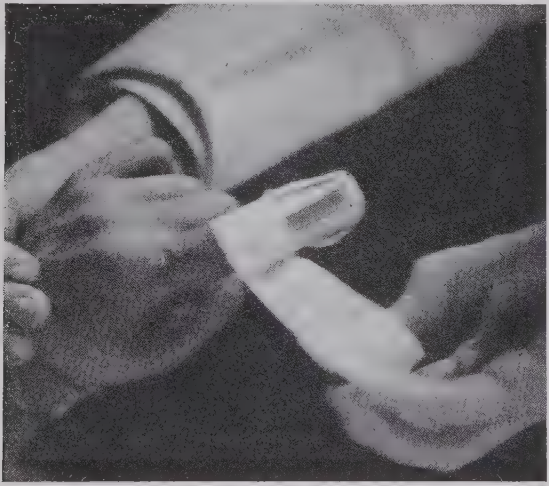

Fig. 71.—Tin strips which act as a protection to the injured finger allowing the employee to continue at work.

Splints of all sizes should be prepared and always ready for immediate application to all fracture cases. The delay in preparing a splint for the immobilization of a fracture is annoying to the patient and often shows a lack of efficient management in the office.

Before leaving this question of dressings the author desires to re-enforce what has been said regarding the use of sterile dressings. About two years ago he visited five surgical dispensaries in plants and five private offices where the doctors attended many minor injury cases for insurance companies. In only three of the plants dispensaries and only one of the private offices were sterile dressings used. In the others gauze was bought from drug stores in the commercial,

so-called sterile, five yard rolls. The doctors would cut off the necessary amount of gauze needed for the dressing by pulling it out on a table and cutting it with unsterile scissors. Perhaps the first piece used was sterile but certainly none of the remainder could be. Infections are bound to be more prevalent if these methods are used. One doctor never used gauze but simply covered the wound with the ordinary commercial bandage. Every surgeon should strive to make the minor surgery carried on in industry as ideal, from an aseptic standpoint, as the surgery done in our best hospitals. Such methods have wonderful educational value in teaching the employees prevention.

Sources of Accident Cases.—The great bulk of accident surgery naturally is derived from injuries received directly as the result of occupations or of conditions in the plant. However, many employees receive injuries outside the plant or while at home. These outside accidents have come to be known as "home accidents" in contradistinction to those received while at work.

Major home accidents like serious illnesses are usually treated by the family physician or the surgeon he calls in. Often when the visiting nurse reports neglectful treatment of such cases the plant surgeon is forced to take charge.

But minor home accidents are frequently neglected by the employees. They lie around the house for days with a swollen ankle, the result of a sprain, or with an infected hand due to some slight abrasion, trying home remedies and otherwise temporizing with the condition rather than consult a physician. Time lost from these slight injuries is excessive. But if the employee knows that he can report to the plant dispensary and receive free treatment he usually comes to work in order to see the doctor. Proper treatment can be instituted and the case supervised, and many times the employee can be assigned to work which will not interfere in his recovery.

For three years it was the policy of the plant with which the author was connected to refer all home accident cases, even the slight injuries, to the family physicians. We limited our care of these cases to emergency treatment only. Many who were thus referred failed to see a doctor but simply remained away from work until the injured part healed. Undue loss of time from work resulted.

Gradually we began to treat these home accidents when they called at the office. More and more of the employees took advantage of this until in 1916 there were 4570 home accidents cared for by the plant surgeons. Approximately 95 per cent. of this number lost no time from work, except that due to reporting to the office for their daily dressing. With the old policy at least 50 per cent. of these cases would have remained at home, many because it was necessary to go

to their family physician for dressings and naturally they would not report for work for a part of the day.

Proof of the value of this system is seen in the following extract from the safety engineer's report to the general superintendent:

"The number of home accidents treated by the hospital has risen from 2896 in 1915 to 4570 in 1916, an absolute increase of 57.8 per cent., or a relative increase of 32 per cent. The reason that the employees are making more use of the hospital in cases of accidents occurring outside the plant is due to the more liberal policy of the hospital in treating home cases, which was adopted with a view of reducing time loss in these cases. That this new policy has produced most satisfactory results there is no doubt."

Occasionally one of these injured cases, for which the concern is in no way responsible, will develop complications which adds greatly to the expense of continuing this free treatment. However, if the surgeon has started free care, when the case seemed only a minor affair, he must continue the same policy when it becomes serious.

The expense connected with the treatment of these minor home accidents, even with the occasional serious case arising, is more than compensated by the increased efficiency of these employees and the diminution in time loss.

Schedule for Dressings.—Much loss of time from work can result from lack of system in the reporting of employees to the hospital for their dressings. If employees are simply told to "come back tomorrow for a dressing" most of them will report the first hour of work with the result that the congestion in the office interferes greatly in the surgeon's work and unnecessary delay in treatment. To avoid this a small hospital card, or pass, can be given to each injured case on which the date and hour for the next dressing is marked by the nurse at each visit. By our system ten patients reported every twenty minutes.

PREVENTIVE SURGERY

Preventive surgery is a direct outgrowth of human maintenance in industry. It is still a new science in the medical field but the time is coming when it will receive the same recognition as is now allotted to preventive medicine. In practical operation in industry it includes the following:

1. The prevention of accidents.
2. The prevention of complications when accidents occur.
3. The prevention of undue loss of time.
4. The prevention of permanent loss of function.
5. The prevention of threatened illnesses, premature breakdowns, lowered efficiency, etc., by adopting certain surgical procedures.

The prevention of accidents has been thoroughly dealt with in Chapters XXI and XXII. The following letter written by the author, early in his career as a plant surgeon, to the general superintendent of an industry will illustrate some of the preventive methods successfully adopted since then by this and many other concerns. Surgeons entering this new field of medicine will find that the recommendations submitted in a memorandum such as this do not always receive the prompt approval of the management, but patience and perseverance will usually result in the final adoption of these methods.

"Mr. ———: Safety first appliances installed last year prevented a great number of accidents. An excellent example is afforded by the reduction of accidents due to conveyors. In 1912 there were 101 accidents directly due to the new conveyors, while last year only four accidents could be traced to this cause.

"A careful study of all the machines and processes in the plant would reveal many other places where safety appliances would reduce the accident rate. While the medical staff and the safety engineer are constantly striving to anticipate accidents by installing these appliances, yet the man on the job is in the best position to perceive hazardous conditions, especially if he is trained until he is imbued with the spirit of prevention.

"I wish to recommend that the doctors, the safety engineer, the management and all the employees be urged this year to put forth a great effort to prevent both major and minor accidents and complications, especially infections.

"The first step in this direction is to appoint an *accident prevention man* in every department or two or three such men in the larger departments. Their duties would be:

"1. To report the need of any new safety appliances to the Safety Engineer. Quite often the necessity for some safety appliance is not recognized until after a serious accident has occurred. This prevention man would constantly study conditions in order to foresee such a need.

"2. To study the causes of minor accidents and endeavor at all times to remove these. For example this man would soon develop the habit, and spread it to others, of picking up every loose nail from the floor or of removing obstructions which might cause falls.

"3. To see that every employee who receives an injury, no matter how slight, paints it at once with iodin and then reports to the doctor.

"4. To prevent employees from rendering first aid to one another, as for example the removing of foreign particles from the eye or extracting slivers.

"5. To receive reports from the doctor concerning injured employees who fail to report at once, or concerning accidents in his department which apparently could have been prevented.

"6. To receive periodical instructions from the safety engineer and from the doctors on all matters of prevention and on certain first aid methods which will make them competent to render the same if occasion arises.

"The number of safety appliances which have been installed following suggestions from the employees demonstrate how valuable these men can be in this respect.

"Last year 610 cases of infection developed after injuries. Twelve, or 1.9 per cent., of these used iodin and reported to the doctor at once. Twenty-four, or 3.9 per cent., reported at once without using iodin.

"These thirty-six cases were only slightly infected and none of them required opening nor lost time from work. The remaining 574 cases reported from one day to two weeks after receiving their injuries; 520 of these required opening and all of them lost time from work, with an additional decrease in their efficiency while working with a finger or hand bandaged. Of this number 42 per cent. used iodin sometime later, while 52 per cent. failed to use it at all. From our past experience we know that the immediate use of iodin and then reporting to the doctor at once would have reduced this number of infections at least 90 per cent. An alert prevention man in the department would be one of the best means of training all employees to observe these rules.

"It is a common practice for some man to try to remove a sliver from a fellow employee's hand. Often the part is so lacerated that an entrance for infection is the result; or only a part of the sliver is removed, the remainder being discovered a few days later when the member becomes infected. Great damage is often done to the eye by similar attempts to render first aid by an employee. Our prevention man could forestall these misdirected efforts.

"Our figures are very striking in regard to wounds from splinters. Two hundred and eighty employees reported to the doctor on account of sliver wounds last year. One hundred and twelve, or 40 per cent., of these reported late with the part infected. All had either successfully or otherwise endeavored to remove the splinter themselves or the same effort had been made by a fellow employee or some member of the patient's family. None of the cases reporting early to the doctor, who removed the splinter under aseptic precautions, become infected.

"Occasionally a very serious accident occurs where first aid must be rendered at once in the department. In those departments where these major accidents are liable to occur we have placed first aid kits and two men have been carefully instructed by the doctor in the various first aid methods. This system should be extended so that the

prevention man in every department is a thoroughly trained first aid expert. These serious accidents may occur in the most unexpected places.

"Each prevention man should have at least two understudies who can in turn take charge of this prevention work if occasion arises. Such a system would give us missionaries who would spread the spirit of prevention throughout the working force.

"I would further recommend that each department be given a rating according to their percentage of accidents per employee last year and that a contest be developed to see which department will have the greatest percentage of reduction in accidents each year. To further stimulate this effort a bonus should be given to the first, second and third most successful departments in carrying out this program of prevention."

The above letter surely demonstrates that this branch of preventive surgery is only limited by the vision of the responsible workers in this field.

The prevention of undue loss of time from work is best attained by treating every case of injury as serious from its inception until completely cured. Temporizing with slight infections, or with sprained backs; neglecting to diagnose early every case of fracture, or by considering some cases of apparent sprains as trivial, and later discovering that a true fracture is delaying the recovery; or sending some injured cases home when they really should have the advantages of the best hospital treatment, are all examples of undue loss of time from work by injured employees which it is within the power of the surgeon to prevent.

Early diagnosis, the adoption from the very first of the best line of treatment, constant watchfulness for complications, and starting early to restore function in an injured part are the best means of preventing permanent deformities. In order to accomplish this the surgeon must be constantly on the job. He cannot leave important dressings, or the decision as to when massage or passive motion shall begin in an injured member, nor any other important point of judgment to some inexperienced interne. He must feel the full responsibility of the case and act quickly and wisely if he is to be a true preventive surgeon.

The constant supervision of the physical status of a large group of people, such as is carried on in certain industries, reveals many conditions which need surgical interference. Some of these offer opportunity for classical operations but are not really essential to the health or efficiency of the employees. Others, which apparently cause no inconvenience to the employee at the time, urgently need surgical care in order to prevent future illnesses or premature break-downs.

Frequently these conditions are causing an unknown loss of efficiency to the workmen which could be relieved by surgical interference.

This type of surgery requires the most careful judgment on the part of the surgeon. It is not so difficult to convince a patient suffering from some acute surgical condition causing intense pain to undergo an operation, but excellent arguments must be presented in order to persuade an employee in apparently good health to submit to one of these preventive surgical operations. The economic result is the best argument which can be advanced. If an employee can be shown that the removal of some condition, to which he has paid little attention in the past, will tend to improve his health, will prolong the period of his working capacity and will give him an immediate increased efficiency he will usually welcome such surgical procedure. The surgeon must be sure of his results before recommending operations on these grounds.

One of the most classical examples of this type of preventive surgery is afforded by the work of our oral surgeons. A few years ago Billings and others called our attention to the part played by focal infections in rheumatism, arthritis, endocarditis and similar conditions. In order to relieve people suffering with these diseases, search for foci of infections was made and the same were removed. The eradication of focal infections to prevent the occurrence of these diseases followed in logical sequence.

The majority of up-to-date industrial surgical dispensaries now have their dental departments where this type of preventive surgery can be practised. (See Chapter V.)

Diseased tonsils is one of the most common conditions found among employees. The condition is equally prevalent among males and females. They seem to cause more time loss and complications among the girl employees, however, than among the men. Recurring attacks of tonsillitis seem to occur with equal frequency among both sexes but headaches, nausea and backaches, all of which have been relieved by the removal of the diseased tonsils, caused the greater loss of time among the girls.

In 1914 the author began to recommend the removal of tonsils to all employees who showed signs of definite diseased conditions, with resulting loss of efficiency, due to the tonsils. As an inducement to the employees to have this operation performed, the surgeon offered his services free of charge. For those who could not afford to pay for a bed at the hospital arrangements were made for free hospital care; the others were charged only a nominal hospital fee. Approximately 250 tonsillectomies were performed for the employees by the surgeon and a far greater number had the operation performed, by the surgeon of their choice, on the recommendation of the medical staff. These

operations, which the author performed, were always done in the hospital under the most aseptic precautions and the patients were required to remain there at least 24 hours. All cases recovered without any complications except two who had severe hemorrhages. In every case it was carefully explained to the employee that the operation was offered on the sole responsibility of the surgeon and not as an activity of the concern.

In practically every instance this preventive surgery has given the most excellent economic results. Male employees who frequented the doctor's office, complaining of sprained backs, lumbago and backache were relieved of these troubles in many instances. The girl employees who reported to the office on account of headaches, attacks of nausea and fainting, signs of fatigue, frequent colds and other conditions traceable to this focal infection, seldom called at the office on account of these conditions after the tonsillectomy. Many of these employees were absent four or five times during the course of a year on account of acute tonsillitis. The lost time averaged from two days to a week in each attack. Where the tonsils were completely enucleated all of these employees ceased to lose time on account of this disease. In only two of the author's series, due to small tags of tonsils, did subsequent attacks occur.

In 1915 the records of 28 employees, on whom the author had operated for diseased tonsils, were carefully scrutinized to ascertain whether or not the desired economic results were actually being obtained. This scrutiny showed that for the two years previous to the tonsillectomies these employees had made 160 visits to the doctor's office, chiefly on account of tonsillitis, colds, sore throat, headache, conjunctivitis, nausea, pains in back, pains in joints, swollen glands and general fatigue. During the same period this group of employees had remained at home 71 times on account of sickness. Their chief illnesses were tonsillitis, colds, headache, rheumatism, neuralgia, influenza, and a few other conditions which seemed to have no connection with the tonsils.

For the two year period following their tonsillectomies this group made 68 visits to the doctor's office and were absent from work only 33 times. A reduction in both instances of over 50 per cent. in time loss. The conditions causing these absences were as follows:

4 on account of colds
4 on account of stomach trouble
4 on account of rheumatism
5 on account of influenza
6 on account of dysmenorrhea
2 on account of bronchitis
2 on account of sore throat and earache

3 on account of headaches
1 on account of pleurisy
1 on account of appendicitis
1 on account of cholecystitis

The war interfered with the obtaining of complete statistics on all of the tonsillectomies but I am positive that the removal of diseased tonsils among employees, as well as among any other group of people, will result in greatly improved health and is a measure of the greatest economic importance to industry.

It is amazing with what ease a small epidemic of tonsillitis will spread among a group of employees working in the same department. To avoid these epidemics, if the employees will not submit to the operation, I have made it a point to recommend their transfer to work which segregates them as far as possible from their fellow workmen. Under the chapter on "Hand Infections" the relationship between these and diseased tonsils is pointed out and affords another example of the importance of this type of preventive surgery.

The presence of an unsightly birth mark or nevus on an employee's face, or of a hairy mole on the lip, or of a large sebaceous cyst on the scalp is often the cause of lowered efficiency in an employee. The condition may make one self-conscious or backward, or it may result in a foreman forming a wrong judgment concerning the ability of the workman. The surgeon can gain the confidence of these employees and explain the resulting damage which these conditions are causing them. After their confidence is gained most employees will welcome the opportunity of having these unsightly growths removed. The gratitude of these patients and the energy they display in overcoming the prejudice which existed either in their own minds, or in the minds of others, well repays the surgeon for his interest in them. Surgery performed for the purpose of preventing decreased efficiency is perhaps a new viewpoint but it is a field which every surgeon in industry has an opportunity to thoroughly investigate.

The above examples of the scope of preventive surgery are sufficient to demonstrate that this field is comparable in importance and interest to the older and well-recognized work of preventive medicine.

CHAPTER XXXII

FIRST AID

First aid, as used in industrial surgery, consists of such surgical or medical procedures as may be given to a patient by a layman pending the arrival of a physician or during the transportation of the patient to the physician. Untrained individuals often render first aid care on their own responsibility. Such assistance is often necessary, but to be of the greatest value it should be administered by a thoroughly trained first aid expert.

During the last ten years many advocates of first aid care sprang up throughout industry. Lay associations were formed and doctors, without sufficient training or experience in industrial surgery, were called in to lecture on first aid. First aid diplomas have even been issued, giving the layman a sense of great confidence in his ability to care for the injured. Many have advocated a national first aid movement which would train millions of our civilian population as to just what to do immediately for the injured man or woman. If the teachings of such an association were limited to three or four simple but essential principles, and the rest of their energy was devoted to "What Not to Do," there is no doubt but that such a movement would result in the saving of thousands of lives during the course of a year. But if the efforts of these half-trained first aiders were allowed to go unbridled among minor injury cases many of them would not see a doctor until some serious complication had developed.

Recognizing the importance of standard first aid care to the injured civilian forces, many different individuals and associations have endeavored to work out a logical system of standardization. Dr. Joseph Colt Bloodgood's questionnaires and investigations on this subject have resulted in stimulating these efforts, even though, as Bloodgood himself says, this work resulted only in the expenditure of considerable sums of money and the accumulation of so much material that he alone could not arrive at any logical conclusions.

The committee on Standardization, under the leadership of Dr. Rucker, of the United States Public Health Service, took over the data which Dr. Bloodgood had collected and started a further investigation on this subject. The war interfered with this study, but it is hoped that when conditions once more become normal much valuable information will be presented to the country as a result of the work of this Com-

mittee. The Conference Board of Industrial Physicians, The National Electric Light Association, The Bureau of Mines—Department of the Interior, The National Safety Council and other organizations have brought out valuable contributions on the subject of first aid.

While excellent results have been obtained by many of these standardized first aid methods when properly supervised by physicians, yet one outstanding criticism is applicable to the majority, viz., they are too extensive and tend to make embryo physicians out of the trained first aid assistant.

Fig. 72.—First aid station at Colorado Fuel & Iron Co. A trained nurse is always in attendance.

In organized industrial surgery three first aid systems have been developed which deserve mention:

1. The best system is found in a few industries which employ a sufficient number of doctors and nurses on the premises at all times so that immediate emergency treatment by a qualified physician can be given to all injured employees. The only first aid care needed in such industries is: the application of some antiseptic at once by the employee himself or by some fellow employee to open wounds; the resuscitation of employees who have been overcome by gas, electric shock or similar conditions; the control of hemorrhage by the application of hemorrhage pads or the tourniquet; and the removal of the injured party from a position to preclude further injury. Thus in those industries where a doctor can be summoned to a department within four or five minutes certain employees should be taught these simple first aid methods. Above all every employee should be warned

against unduly moving of the injured, against manipulation of broken parts, against ever touching the open wounds and certainly against endeavoring to remove foreign bodies. If the surgeon, on his arrival, needs assistance in these maneuvers he will request it from some intelligent employee in the department. The majority of persons injured in the plant can be brought to the doctor's office at once where proper emergency care can be given. For these the only first aid needed is the application of some antiseptic to the open wound; this can usually be done by the employee himself or by some fellow employee. In these plants the nurses often respond to calls from departments and they become quite expert in rendering the necessary first aid. They take charge of transporting the patient to the doctor's office or summoning the physician if they think it unwise to move him at once.

Fig. 73.—A first aid station in the Ford automobile factory.

2. The second method in vogue in some industries consists of first aid stations in various parts of the plant, with a well trained first aid man or a qualified nurse in charge. Injured employees are taken at once to these first aid stations, or the attendants are called to them when the injured party cannot be moved. These assistants render the necessary first aid care and then transport the injured to the doctor or immediately summon the physician to the case. In one industry medical students are employed for three hours a day on this work, so rotating that it does not materially interfere with their studies.

Here again the first aid is limited to the application of antiseptics and a sterile dressing, checking of hemorrhage, combating shock and resuscitation. All manipulations or direct treatment of the wound is left to the physician who is close at hand. (Fig. 73.)

3. The third method is employed in industries engaged in unusually hazardous occupations and where the employees are scattered over a large territory, as, for example, in mines, in large steel plants, ship-building yards, etc. While physicians are employed by these concerns, yet they are usually stationed at the plant hospital which may be a half mile or a mile away from the point where some of the workmen are employed. The best organized medical work in such concerns has recognized the need of competent first aid assistants scattered throughout the working forces. To meet the situation the physician has trained first aid teams in every department. The teams are taught how to immediately apply an antiseptic to open wounds and then cover them with a sterile dressing; how to check hemorrhages and combat shock; how to give artificial respiration; how to apply splints to fractured limbs and the best means of transporting the injured employee to the doctor. In some instances the medical staff depends altogether on these teams to render first aid care and to bring the patient to the hospital, while in others the doctor is summoned from the hospital by one member of the team while the others are rendering the necessary care. The latter plan is better, as the physician can thus take charge of the case earlier than if he waits for the seriously injured to be conducted to him.

During the early popularity of the first aid movement many more elaborate schemes than the above were promulgated. In 1914 the author visited a number of industries in order to study this question of first aid. He was astounded at the extensive preparation for this work which some concerns had made. For example, one industry had provided a very pretentious first aid kit, which contained a complete set of instruments, all varieties of commercial splints, six different sized bandages but no sterile dressings; one compartment of this kit was set aside for medicines and in this was found such drugs as castor oil, Epsom salts, whiskey, aromatic spirits of ammonia, morphin, cocain, Sun cholera tablets, a cough mixture, Jamaica ginger and several others which would enable the layman to treat medical cases as well as to render a questionable first aid to the injured. One can see at a glance that such power as this placed in the hands of a layman was dangerous and would tend to eliminate the physician from a field where he was most urgently needed. The very best types of first aid work were found in those industries where the doctor insisted on seeing the injured employee just as soon after the accident occurred as it was possible to bring the patient to the surgeon or the

surgeon to the patient. In those plants where the hazards of the occupations necessitated first aid kits the contents were limited to the necessary bandages and sterile dressings, a few splints, an antiseptic, a tourniquet and aromatic spirits of ammonia to be used when a stimulant was necessary. Short, terse instructions went with each kit and limited the layman in what he could do for the patient and impressed upon him the importance of getting the physician on the job at once. The first aid methods consisted only of preventing infection, checking hemorrhages, combating shock and resuscitation. All other treatment was left to the surgeon.

Fig. 74.—The contents of the best first aid kits are limited to: *a*, Tincture of iodin and applicators; *b*, bandages and sterile dressings; *c*, some form of tourniquet; *d*, a few splints; *e*, aromatic spirits of ammonia.

As a result of this study the author has adopted the following first aid rules:

1. All injured employees, no matter how slight the injury, must report to the doctor's office at once.

2. If the employee is so injured that he cannot walk to the doctor's office the physician must be summoned to him at once.

3. Every open wound which penetrates the skin, no matter how slightly, must be painted with iodin at once. The foreman or the selected first aid man in the department must pour iodin into the extensive open wounds at once. For this purpose a small rack, containing a bottle of iodin and a bottle of applicators must be placed in a conspicuous spot in every department (as many as twelve of these racks have been placed in the larger departments). Instructions on each rack and on the bulletin boards warn the employees to use iodin at once in the case of injury and then immediately to report to the doctor. (See Fig. 75.)

4. First aid kits must be placed in all departments where machinery

is used or where other hazardous processes obtain. A wooden box, 15″ × 9½″ × 7″ fastened by a strong clasp and equipped with one handle, wh ch acilitates carrying is to be used as a conta ner for the first aid material. This box is divided into four compartments: a large one for the various sized dressings, a smaller one for bandages, the tourniquet and a spool of adhesive plaster, a third compartment just large enough to hold the container for the iodin and applicators

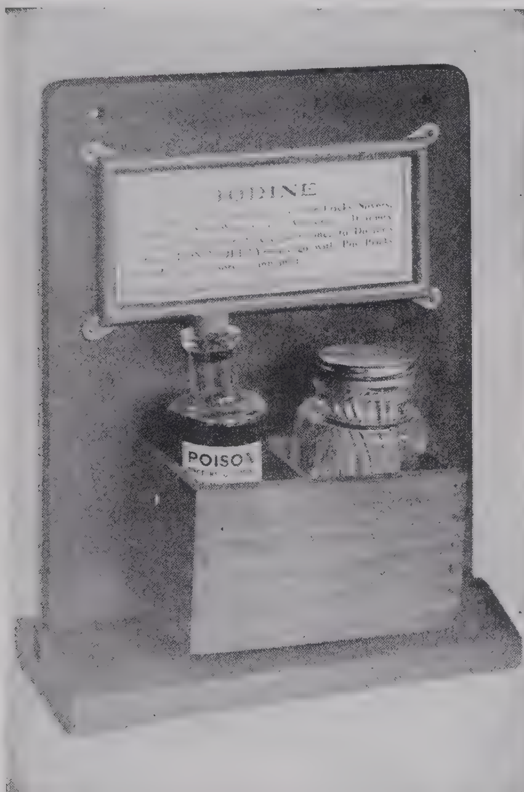

FIG. 75.—Rack used by author to hold bottles of iodin and applicators. These are placed in conspicuous places throughout the working place.

and a fourth small compartment into which is placed the aromatic spirits of ammonia. (See Figs. 76 and 77.)

(*a*) The dressings are placed in three cloth bags, according to their size, as follows:

Small sterile dressings, rolled individually in tissue paper for finger bandages or other small wounds.

Middle sized sterile dressings, rolled individually in tissue paper for the larger wounds.

Four large sterile hemorrhage pads, 12″ × 18″ (see Chapter

Fig. 76.—Author's first-aid kit.

Fig. 77.—First aid kit with four compartments packed.

XXX) rolled individually in tissue paper, to be used as compresses in case of hemorrhages or as dressings for large wounds.

(*b*) The bandages consist of 1″, 2″ and 3″ gauze bandages (four of each) and four strong cotton bandages 3″ by 10 yds.

(*c*) A spool of 3″ adhesive plaster must be included in every kit, to be used to hold dressings in place when bandages cannot be applied.

(*d*) The tourniquet consists of a 3″ × 5 yd. rolled, strong, cotton bandage, plainly marked "*To be used in case of hemorrhage*" (the author discarded the use of the rubber tourniquet in the hands of lay assistants because of the dangers arising from its use. The first aiders were instructed to place a compress over the artery above the bleeding point and to bandage the same as tightly as possible with this cotton bandage).

(*e*) Iodin is supplied for the purpose of immediate application to all open wounds, no matter how extensive. This is either to be painted on with an applicator when possible without touching the wound with the fingers, or to be quickly poured on directly from the bottle.

(*f*) The aromatic spirits of ammonia is to be used in case of fainting or shock.

On the inside of the lid of this first aid box the following legend is printed in large type: (See Fig. 77.)

READ CAREFULLY

This is a **first aid** outfit **only.** It is not to be used for subsequent dressings. The purpose of the **first aid man** is not to replace the **doctor.** Send every injured employee to the Doctor's Office **at once, no matter how slight the injury.** Use these supplies for temporary dressings until proper medical care can be obtained.

DIRECTIONS

Iodin and Applicators.—Apply iodin *at once* to all injuries, small or large, that break or penetrate the skin. Paint over only once. Do not wash injured part with soap and water, hydrogen peroxid, nor any other antiseptic. Simply paint over with *iodin. It kills the germs and renders all dirt in the wound inactive.*

Small Dressings.—To cover cuts or bleeding wounds. Remove tissue paper and unfold gauze. Avoid touching that portion of the dressing which goes next to the wound; bandage.

Hemorrhage Pads.—To be used on large wounds or bleeding surfaces. Unfold the pad without touching the surface applied next to the bleeding area. With bandage bind on sufficiently tight to control bleeding.

Constrictor or Bandage Tourniquet.—When severe hemorrhage occurs in any part of the arm or leg wrap the constrictor about the extremity a short distance above the point of hemorrhage and tie sufficiently tight to control the bleeding.

Aromatic Spirits of Ammonia.—To be used in case of fainting or shock. One-half teaspoonful in one-half glass of water and give to patient to drink, or let the patient inhale the fumes from the bottle. In case of fainting lay person flat on back either on the floor or on a table until the faint is over.

5. In every department where accident hazards exist, two or more intelligent employees must be trained in the following first aid methods:

(*a*) **To Prevent Infections.**—Iodin is to be applied immediately to every open wound as already described. Foreign bodies are only to be removed when the same can be done without inserting the finger into the wound. The proper sized sterile dressing is then removed from the tissue paper covering and applied to the wound without touching the inner side, which goes next to the wound, with the fingers. The dressing is to be held in place by a bandage or by adhesive plaster. Care must be observed at all times not to unduly move the injured part. Washing with soap and water or other manipulation of the wound is absolutely prohibited at all times. In case of a compound fracture (a broken bone accompanied by an open wound) the wound is simply to be covered with iodin and a sterile dressing applied. Leave manipulation for the surgeon when he arrives. In wounds about the eyes exercise great care to prevent the iodin entering the eye.

(*b*) **Checking Hemorrhage.**—In case of excessive bleeding from a wound a hemorrhage pad is to be applied without touching the surface next to the wound and the bleeding is then to be checked by a firm pressure being made over the pad with the fingers. After two minutes of strong pressure if the bleeding continues apply the tourniquet; if the pressure has checked the hemorrhage, bandage the hemorrhage pad snugly in place. In applying the tourniquet a small compress should be made from a middle-sized dressing and the cotton bandage, marked *for hemorrhages*, should be bound about the member as tightly as possible and tied in place. All of these maneuvers must be done as gently as possible. In case of hemorrhage do not administer aromatic spirits of ammonia unless absolutely necessary.

(*c*) **Combating Shock.**—Every seriously injured person must be immediately placed in a prone position. To do this he should

not be moved any great distance. Whenever possible he must be protected from extremes of heat and cold, especially the latter. He must also be protected from a damp ground or a cold cement floor. If he cannot be moved to a dry, warm spot, then several coats should be placed under him. All of the body, except the wounded part should be immediately covered by blankets or overcoats. The head must be on the same level with the rest of the body except in case of hemorrhage or fainting, when it should be at a lower level. In the case of shock these precautions must be doubly observed. Heat should be applied about the body. This can be done by filling dinner pails, bottles or jars with hot water or by the use of hot water bottles or hot bricks placed near the body under the coverings. Precautions must always be taken not to burn the patient. Half a teaspoonful of aromatic spirits of ammonia in a half a glass of water should be given at once if patient is conscious. Never give an unconscious person water or other liquid as it may enter his windpipe and strangle him. If conscious give the patient all the water he wants in small amounts at frequent intervals. In case of vomiting turn the head to one side so that he will not swallow the vomited matter and strangle himself. Loosen all tight clothing. Avoid undue movement of the body. Do only what is necessary to make him comfortable and keep him warm.

(*d*) **Resuscitation.**—To be used in cases of electric shock, suffocation or asphyxiation or other conditions which have apparently caused cessation of breathing. Artificial respiration by the *Schäfer* or *prone method* should be employed as follows: Place the person on his abdomen; remove from his mouth all foreign bodies, such as false teeth, tobacco and gum; pull and keep the tongue forward; turn his head to one side and rest it on his forearm, so that the mouth and the nose will not come in contact with the ground and extend the other arm forward. If the person is thin prepare a pad of folded clothing, blankets, or other material and place it under the lower part of his chest. Do not make this pad too thick. Do not wait to loosen the victim's clothing but begin artificial respiration without delay. An assistant may remove all tight clothing from the victim's neck, chest and waist; blankets, hot water bottles, safety lamps, or hot bricks well wrapped in paper or cloth should be placed about the person by an assistant. Kneel, straddling the person's thighs and, facing his head, rest the palms of your hands on his loins—on the muscles of the small of his back—with your thumbs nearly touching each other

and your fingers spread over his lowest ribs; with arms held straight swing forward slowly so that the weight of your body is gradually brought to bear on the person. This operation, which should take three or four seconds, must not be violent, lest the internal organs be injured. The lower part of the chest and also the abdomen are thus compressed and air is forced out of the lungs. Now, immediately swing back slowly so as to remove the pressure, but leave your hands in place, thus returning to the original position. Through their elasticity the patient's chest walls expand and his lungs are thus supplied with fresh air. After two seconds swing forward again and repeat deliberately, 16 to 18 times a minute, the double movement of compressing and releasing—causing a complete respiration in about four seconds. If a watch or clock is not available, follow the natural rate of your own deep breathing, swinging forward with each expiration and backward with each inspiration. Continue artificial respiration, if necessary, for at least three hours without interruption until natural breathing has been restored, or until a physician arrives. Even after natural breathing begins carefully watch that it continues. If it stops, start artificial respiration again. Do not give aromatic spirits of ammonia or other liquids by mouth until the patient is fully conscious. Keep all bystanders away from the patient in order to give him plenty of air. (Various machines to assist or compel artificial respiration have been invented. Only an expert in the manipulation of such a machine should be allowed to use them.)

(*e*) **Fractures.**—In case of fractures never move the patient, unless it is to free him from further danger, until the part has been thoroughly immobilized with a splint. The injured limb should be immobilized with the least manipulation possible. A splint can be made by using a thin board slightly wider than the injured member and covering it with one or two of the hemorrhage pads. It is then firmly bound to the member with one or more of the cotton bandages. These same principles hold in the case of dislocations. Leave the manipulation of the broken or dislocated parts to the surgeon.

(*f*) **Burns.**—In case of burns the patient is to be brought as rapidly as possible to the doctor's office or the doctor immediately summoned to the patient, the nature of the case always being explained in the summons. Cotton rags and other material are not to be placed on burns. If the patient is in shock, treat these symptoms until the doctor arrives.

The above rules and methods are sufficient for the first aid care of any injured employee when a doctor can be summoned very shortly. I wish to again emphasize the fact that the ideal system of industrial surgery is based upon the immediate treatment of a wound by a qualified surgeon.

A few years ago no one question in accident surgery caused more discussion than the application of proper antiseptic to an open wound. Many good surgeons decried the use of any antiseptic and advocated thoroughly washing with soap and water. Some instructed their first aid assistants to immediately wash a wound with hot water and soap. Such a method is no longer recommended as a first aid procedure and very few surgeons to-day apply soap and water to any wound. The danger of grinding infected material deeper into the injured parts by such a washing process is greater than if the wound was left absolutely alone. The pendulum then swung to the other extreme and it was advocated to thoroughly wash the wound with bichlorid of mercury or hydrogen peroxid and then paint it with carbolic acid, followed by alcohol. It is still a common sight to see a wound washed, antisepticized and otherwise picked at for ten or fifteen minutes before the dressing is applied. Even then the dressing may be frequently soaked with bichlorid or some other antiseptic.

The replies to the questionnaire sent out by the Committee on Standardization of First Aid Methods, as well as the investigations of Dr. Bloodgood, show that at least 90 per cent. of the surgeons in industry advocate the use of some antiseptic as a first aid measure. Approximately 80 per cent. of these advocate tincture of iodin as the best and most logical antiseptic to be used. The majority of these are in favor of the patient, or a fellow workman, painting the part at once with tincture of iodin, but some of these surgeons fear that such a procedure gives a false security to the employee and lessens the chances of his reporting to the doctor for proper treatment.

My own experience has absolutely convinced me that the immediate use of tincture of iodin to an injured part by the employee himself or by a fellow employee is the most important first aid procedure which can be adopted in industry. In 1909, when I first used iodin in every department of the industry with which I was connected, there was an immediate reduction of 28 per cent. in the number of infections the first month after this plan was installed. To counteract the danger of the injured employee thinking that the use of iodin was all-sufficient, bulletins, letters and constant warnings were scattered throughout the working forces to the effect that "Every injury—no matter how slight—must be painted with iodin at once and then the employee must report to the doctor immediately." Some claim that the reporting to the doctor at once is sufficient. Every year, however, has more

clearly demonstrated that the combination of the use of iodin and the reporting to the doctor at once is superior to the method of only reporting to the doctor at once. The nature of the work in this industry was such as to cause a great many minor accidents from such conditions as pin pricks, nail wounds, slivers, abrasions, etc. The following table clearly demonstrates that the double procedure gives better results than the single method of reporting at once:

Table 17

TABLE ILLUSTRATING THE VALUE OF "USE OF IODIN AT ONCE AND REPORTING TO THE DOCTOR AT ONCE"

	1913	1914	1915	1916
Total number of infections	710	655	586	610
[1]Iodin used in Dept. reported at once	18	16	5	10
[1]Iodin not used in Dept. reported at once	28	28	12	12
Rules not observed	668	611	569	588

The degree of infection in those cases where iodin was used or where they reported to the doctor's office was very slight and consisted only of redness and a small degree of swelling about the wound or a drop of pus. The fact that none of these lost time from work or required an incision clearly points to very mild infection.

The large number of infected cases that failed to observe these rules came from the following groups:

(*a*) New employees who had not yet learned their lesson (one year 80 per cent. of the infected cases came from this group).

(*b*) Employees who failed to report to work and who could not be located by the visiting nurse, and otherwise neglected their dressings.

(*c*) Employees who removed their dressings at home and applied some home remedy.

(*d*) The employee who "didn't believe in doctors."

(*e*) Christian scientists.

Such figures plainly show that no matter how extensive your preventive measures are, or how extensive an educational campaign you wage, these careless employees will always be a source of trouble.

During these four years there were 39,672 accidents cared for in this industry. These include the infected cases shown in the foregoing table. Out of this total number of accident cases, even including the very serious crushing and mutilating wounds, where the employees observed the first aid rules and continued under the constant care of the plant surgeon the infection rate was only 1.2 per cent.

[1] None of these required incision nor lost time from work.

Bloodgood, as a result of his investigations concerning the various methods used by several hundred industrial surgeons, summarizes his conclusions concerning various uses of a first aid antiseptic by saying: "As far as can be ascertained from the industries the answer is practically uniform: that an antiseptic is of immense value in the wounds in industry in preventing infection. Whether that antiseptic should be applied by the individual or by the doctor who sees the wound quickly is a question on which I can get very little evidence. The great majority of surgeons in industries, however, agree that iodin is the best antiseptic to be used."

Many of our best industrial surgeons advocate a much more extensive system of first aid than that outlined by the author. This is partly due to the fact that these doctors have fewer assistants so that it is impossible for a physician to always render the emergency treatment at once; or because the employees are so scattered that fifteen minutes to one or two hours must elapse before it is possible for the doctor to see the patient. Naturally, under these conditions, they must depend more upon lay assistants. Bear in mind, however, that even these reasons are not sufficient to permit of too much leeway being given to the first aid man.

Doctor Loyal Shoudy of the Bethlehem Steel Company has developed a very excellent first aid system, which is constantly supervised by the doctor and his assistants. This consists of teams of six or eight men, who are thoroughly trained in a great many different first aid methods. Every large department has its team. He has extended this system to include not only the home plant but all of the subsidiary organizations. In order to stimulate enthusiasm and expertness among the various first aid teams he holds an annual First Aid Meet. The teams enter intensive training for several weeks, solving many theoretical problems of first aid care to the injured. A preliminary interdepartmental first aid meet is held and the winning teams then represent the various plants at the final meet. The problems for the contest are selected from the records of actual injuries which the various first aid teams attended during the preceding year. In the recent first aid meet held at Bethlehem the following problems were selected for execution by the contesting teams:

1. Dress *compound fractures of leg, L.*, lower third. splints. Eight triangular bandages. One tourniquet. One dressing. Use improvised stretcher. Blanket. Time Allowance 10 minutes.

2. Dress *fracture of knee cap, R.*, *crush of foot, R.*, and *laceration of scalp*. Two splints. Eight triangular bandages. Two dressings. Time allowance 8 minutes.

3. Dress *burns of foot, R., calf of same leg, fracture of lower jaw,*

R., and *laceration of chest, L.* Five triangular bandages. Three dressings. Time allowance 8 minutes.

4. Dress *dislocation of shoulder, L., burn of back of hand, L.*, and *crush of foot, R.* Five triangular bandages. One piece 1″ roller bandage. Two dressings. One splint. Time allowance 8 minutes.

5. Dress *fracture of the back.* Splints. Fourteen triangular bandages. Two blankets. Time allowance 10 minutes.

6. Dress *lacerated shoulder, R.*, and opposite *fractured forearm.* Seven triangular bandages. Two splints. One dressing. Time allowance 8 minutes.

7. Patient found in *unconscious condition* from prolonged inhalation of *blast furnace gas, rescue* (one man method). *Resuscitate* (demonstrate Schäfer and Sylvester methods). Two blankets. Stimulants. Time allowance 5 minutes.

8. Dress *burns* of entire *head, face, back, chest, shoulders*, and *back* of *both hands.* Six triangular bandages. Four dressings. Blanket. Time allowance 8 minutes.

9. Dress *fracture of lower jaw, R.*, and *sprain of ankle, R.* Two triangular bandages. One 2″ roller bandage. Time allowance 8 minutes.

10. *Rescue from electrical contact.*

Instructions

Dress the most serious injury first.

Do not allow fingers to come in contact with underside of dressings.

Grasp artery and use tourniquet in all cases of compound fracture.

Watch for symptoms of shock in all injuries.

Treat for shock in all problems where blanket is indicated.

In dressing patients, kneel on knee next to patient's feet.

While the above were theoretical cases arranged for purposes of the field meet, yet they illustrated the exact nature of the injuries which these first aid teams were called upon to treat during the course of their work. Dr. Shoudy's paper before the 1918 Convention of the National Safety Council thoroughly explains his methods of training these teams.

There is no question but that better results could be obtained if emergency treatment by qualified physicians could be rendered at once in such extensive injuries as these, but in the absence of a sufficient number of physicians to meet the situation, this elaborate plan in a hazardous industry is worthy of great commendation.

One of the greatest functions of these teams is the constant study of works conditions in order to prevent accidents. It is very essential that every first aid man should be first, last and all the time a prevention man.

The N. A. S. O. First Aid outfit is the result of numerous conferences of surgeons from different industries, held under the auspices of the Conference Board of Industrial Physicians. Dr. Lauffer, of the Westinghouse Company, who helped standardize this outfit, describes it as follows: "The container is glass, the contents include (1) drugs and (2) dressings; and are:

1 tourniquet.
1 pr. nickel plated scissors.
1 triangular sling.
12 assorted safety pins.
1 wire gauze splint.
1 two ounce bottle castor oil.
2 three ounce bottles burn ointment.
1 two ounce bottle 3 per cent. alcoholic iodin.
1 two ounce bottle white wine vinegar.
1 two ounce bottle aromatic spirits of ammonia.
1 two ounce bottle 4 per cent. aqueous boric acid.
1 two ounce bottle Jamaica ginger.
1 piece of flannel 24″ × 36″.
1 roll absorbent cotton.
1 roll 3″ × 10 yd. gauze bandage.
2 rolls 2″ × 10 yd. gauze bandage.
1 spool 1″ × 5 yd. adhesive plaster.
4 rolls 1″ × 10 yd. gauze bandage.
6 packages 6″ ×36″ sterile gauze.
1 teaspoon.
1 medicine glass.
2 medicine droppers.
3 paper drinking cups.
12 first aid record cards.
11 finger splints.
12 wooden applicators.
1 instrument box.
1 cotton box.

This detailed list of contents were regarded as the best items to include in the outfit in the year 1915, in the collective judgment of the Conference Board.

"The special requirements of particular injuries are cared for by adding to or subtracting from the standard contents of this jar.

"The rules of procedure for the instruction of laymen were agreed upon by the Conference Board in advance of the se'ection of the contents of the jar, and it will be observed that the first aid taught is preliminary, not final treatment, and that it is designed that the pa-

tient be given reasonable first aid attention, pending the care of the case by a physician."

Dr. A. W. Colcord, of the Carnegie Steel Company, is one of the pioneers in the instruction of the layman in the application of first aid. He states "I believe we have overdone this work; I feel that we have undertaken to teach too much and to allow the layman to do too much. After three years of lecturing to forty special groups on this subject I have boiled down instructions on this subject to just four things:

1. How to treat hemorrhages.
2. How to treat shock and asphyxia.
3. How to transport the injured man with a maximum of speed and a minimum of trauma to the proper place.
4. What not to do: To keep away entirely from the wound; not to administer a dressing; and get to the emergency hospital as quickly as possible.

I believe attempted treatment of wounds by a layman has done infinite harm and that we cannot condemn it too strongly."

In 1917 the Bureau of Mines, Department of the Interior issued a small book on "First Aid Instructions for Miners; a Report on Standardization. This was compiled by a Committee of surgeons consisting of G. H. Halberstadt, A. F. Knoefel, W. A. Lynott, W. S. Rountree and M. J. Shields. Every surgeon in industry should read this book as it is pregnant with excellent ideas, not only on first aid care but on emergency surgical treatment. The following summary shows the extent of the first aid work advocated by these authorities for mine employees:

FIRST AID EQUIPMENT

(Surface First Aid Dressing Station)

"At a suitable place on the surface and near the mine opening there should be a first aid dressing station, which also can be used as a storeroom for first aid supplies. In this building should be a stretcher, woolen blanket, waterproof blanket, and splints, all of which except the splints should be suitably protected from moisture and air in a sealed tin case, or its equivalent. Also there should be first aid packets in germ proof and waterproof wrappings suitably protected in sealed metal boxes, and first aid cabinets.

Contents of First Aid Cabinet

"Each cabinet should contain:

12 sterile triangular (unprinted) bandages.

12 small bandage compresses, each 1″ square when folded upon itself about 15 times, with muslin tails ½ yard long, the center being sewed to compress.

12 medium-size bandage compresses, each 2½″ square when folded upon itself about 18 times, with muslin tails 1 yard long, the center being sewed to compress.
6 large bandage compresses, each 3½″ square and folded upon itself about 20 times, with muslin tails 2 yards long, the center being sewed to compress.
6 packages of sterile picric acid gauze, each containing a piece of gauze 1 yard square.
6 yucca splints or similar material.
1 two ounce bottle aromatic spirits of ammonia.
6 paper cups.
1 teaspoon (horn).
1 tourniquet.
1 pair of scissors.

(From First Aid Instructions for Miners.)

Underground Dressing Stations

"First aid dressing stations should be maintained near the bottom of the shaft or slope and at a central sidetrack. One first aid cabinet should be available for every 100 men or less. At least one man out of every 10 employees should carry a first aid packet which should be refilled when necessary.

Surface Hospital Room

"Where a large number of men are employed, there should be available on the surface a room provided with suitable hospital facilities, and having a surgeon in attendance. The building should be as close to the entrance of the mine as possible and should be supplied with the necessary articles, all furniture and utensils, except perhaps the chairs, to be covered with heavy white enamel."

Suggestions

The authors of this report make the following suggestions:

"1. That as far as possible first aid training be given under the immediate supervision of a regularly registered and qualified physician.

"2. That there be close co-operation with the first aid department of the American National Red Cross in first aid work.

"3. That all examinations for first aid certificates be held by a qualified physician and conform with such standards as may be laid down by the Bureau of Mines.

"4. That it be an imperative rule that in all first aid contests the judges shall be regularly qualified physicians trained in first aid work.

"5. That where it is possible every employee in a mine be trained in first aid work but if this is impossible that at least 1 out of every 10 employees, both underground and on the surface, receive such training."

CONCLUSIONS

This chapter on first aid clearly indicates that the question as to what extent laymen should be permitted to treat injured employees is still unsettled. Practically every worker in this field agrees that a certain amount of first aid care is necessary. They further agree that the extent and method of first aid care should be standardized.

The war interfered with the work of standardization, undertaken by the American Association of Industrial Physicians and Surgeons and also by the Committee on Standardization of the U. S. Public Health Service. It is hoped that these two organizations will get together as soon as the present emergency permits and work out this standardization.

The author believes that all first aid methods should include and be limited to the following:

1. The immediate application of tincture of iodin to all open wounds.

2. The appointment of a responsible person among each group of employees to see that the injured employee reports to the doctor at once.

3. The instruction of two or more responsible persons among each group of 100 employees in the best first aid methods of

(*a*) Controlling hemorrhages.
(*b*) Combating shock.
(*c*) Resuscitation by artificial respiration.
(*d*) Immobilization of fractures.
(*e*) Transporting the injured when necessary

Every report on this subject should point out most emphatically the importance of having a qualified surgeon on the job in industry at all times in order to render immediate emergency treatment.

CHAPTER XXXIII

EMERGENCY SURGERY

Emergency surgery is the first treatment rendered to an injured person by the surgeon. An emergency operation is one performed to relieve some sudden emergency as, for example, the opening of an abdomen to relieve a hemorrhage or a tracheotomy performed because of a foreign body blocking the larnyx.

As used in industrial surgery first aid is rendered by a layman but emergency surgery is always rendered by the surgeon. On the battlefield and in some industries the expert first aid man has been so well trained in his work that often the first aid treatment rendered by him is sufficient. Col. Frank Billings, reporting on the work which he saw at the front in France, stated that frequently the enlisted medical man applied the splint so thoroughly to a fractured limb that it was unnecessary for the surgeon to redress the fracture for several days. Dr. Shoudy has found that quite often his first aid men have executed their work so thoroughly that he was able to send the patient direct to the hospital for permanent care, without giving any emergency treatment. As a general rule, however, it would be a dangerous practice for this first aid care to replace the emergency surgery rendered by a qualified surgeon.

This view is gradually becoming universal and as a result surgical dispensaries are being established in many of our large industries and a surgeon is kept at the plant at all times in order to render immediate emergency surgery and thereby obviate as far as possible the need for the less efficient first aid work.

In fact, well organized medical staffs within our industries, with facilities for treating injured employees immediately after the occurrence of an accident, have made first aid superfluous in the majority of instances. These physicians insist on seeing patients at once before first aid measures have been applied. This limits the need for trained first aid workers to those departments where hazardous processes are carried on and where the employees are so far removed from the dispensary as to render immediate care impossible. Even here the injured employee and the surgeon can get together so quickly that emergency surgery is preferable.

The surgical dispensary, its equipment and the necessary surgical

staff have been fully described in other chapters. (See Chapter XXXI.) Therefore this chapter will be devoted to those conditions commonly arising in industry which require emergency treatment and to a description of the practical methods which have been found most efficacious under the different circumstances.

Two great slogans have developed in connection with accident surgery in industry. One deals with prevention in the pre-accident stage and is known as "*safety first;*" the other deals with the post-accident stage and is represented by "*report at once.*" This reporting to the doctor at once when an injury is received, always qualified by "no matter how slight" is the universal preventive measure adopted by all surgeons in industry. As a result the great proportion of their work consists of the emergency treatment of minor accidents and their subsequent dressings.

In the author's experience a hundred of these minor cases report to the doctor's office for every five of the more seriously injured employees. In the combined major and minor accidents about one injury out of twelve is sufficiently disabling as to require actual lost time from work, providing the injured parties report at once to the doctor. Approximately one of these disabling accidents out of every fifteen causes a disability exceeding fourteen days. In the major accidents, fractures are the chief cause of disability, averaging 42.8 days per case. Sprains and dislocations were second and hernias came third in this class of accidents causing the greatest amount of disability. Thus, in major accidents, the cause of disability can usually be traced to the severity of the injury as these employees are under control and therefore their treatment is uninterrupted. The greatest cause for disability among the minor accident cases was infection. These occurred commonly among two classes, namely, those who failed to report to the doctor at once and those who were careless about their dressings or their return visits. Thus the majority of disability cases in this class can be traced to carelessness and neglect on the part of the patient.

Accidents in the general industries involve chiefly, the fingers and hands, the toes and feet, the eyes, the lower extremities, upper extremities, the back, the head and the abdomen, named in their order of frequency.

The most frequent minor wounds are:(*a*) abrasions; (*b*) contusions; (*c*) lacerations; (*d*) puncture wounds; (*e*) blisters; (*f*) brush-burns; (*g*) foreign bodies in the eye; (*h*) foreign bodies penetrating the soft parts; (*i*) strains; (*j*) sprains; (*k*) tenosynovitis; (*l*) swallowing foreign objects.

Complications oftenest arising from these wounds are infections, ulcers, keloids and scar contractures.

The chief major wounds met with in accident surgery are: (*a*) fractures; (*b*) crushing wounds; (*c*) dislocations; (*d*) penetrating wounds; (*e*) burns; (*f*) loss of members; (*g*) avulsions; (*h*) injuries of nerves, blood-vessels and viscera; (*i*) brain injuries; (*j*) special traumas, as traumatic hernias, traumatic orchitis, traumatic pleurisy, traumatic appendicitis and traumatic neuroses. These severe wounds may have any one of the complications common to minor injuries and in addition the immediate complications of shock and hemorrhage, and the more remote complications represented by systemic conditions occurring as the result of lowered resistance. Naturally permanent deformities more frequently follow these major accidents.

Every variety and degree of the above minor and major injuries may occur singly or in combination and any one or several regions of the body may be involved. The complications which may arise are so numerous and often so surprising in their occurrence that the alertness and skill of the surgeon is taxed to the utmost. No field of surgery is more varied, and therefore more interesting, than this accident work.

In addition to the above, emergency surgery in industry must contend with certain conditions not causing visible wounds but which nevertheless are injuries resulting in the course of employment. These include such cases as suffocation, asphyxiation, acute poisoning, freezing, heat stroke and sun stroke.

The emergency care of any of these accidental conditions involves in every case consideration of a logical sequence of treatment:

1. Prevent complications.
2. Combat immediate complications.
3. Temporary or permanent relief.
4. Apply dressings.

In 95 per cent. of injured cases the line of treatment can follow the above sequence and the expert emergency surgeon automatically considers each of these steps in turn. However, in a small number of cases he is forced to forget every other step and exert all his energies toward combating the worst complication: impending death. Therefore, in 5 per cent. of the cases, steps one and two may be forced to exchange places in the sequence of treatment.

PREVENT COMPLICATIONS

Infections.—In all accident surgery the commonest and most feared complication is infection. In its wake follows many other complications, notably deformities, loss of members, systemic diseases and even death. The prevention of infections is the earliest lesson learned by the surgeon in industry. The majority of these surgeons

have learned by experience that the best methods of prevention consist of three things:

(*a*) Immediate application of an antiseptic to an open wound.

(*b*) The earliest possible treatment of the wound by a qualified physician.

(*c*) Protection of the wound by sterile dressings; regular and uninterrupted care until healed.

Surgeons may differ as to the kind of antiseptic, or regarding some minor points in the treatment, or as to the type of dressing to employ and the frequency of redressings, but no experienced worker in this field differs as to the prime importance of these three steps in preventing infections.

From a careful investigation of the kind of antiseptic used in accident surgery it is safe to say that at least 80 per cent. of the surgeons use some form of tincture of iodin. In the chapter on First Aid and again in the chapter on Hand Infections the author has advanced the strongest arguments in favor of the efficacy of tincture of iodin as a preventive agent. The fact that it is used so universally by the majority of surgeons is only another argument in favor of it as the *antiseptic of choice in emergency surgery.*

The strength of the tincture of iodin advocated varies from 3 per cent. to the 10 per cent. tincture. The majority seem to use a 5 per cent. strength diluted with alcohol. Some have urged the use of glycerin with iodin (one part of glycerin, three parts of iodin) as a means of preventing irritation of the skin or the severe burning complained of by many patients when the application of iodin to a raw wound is made.

The antiseptic should be applied to the open wound as soon after the injury is received as possible. In order to meet this requirement, tincture of iodin with applicators should be kept at regular stations throughout the working place where the injured party or some fellow employee can apply it at once to the injured surface. This method is fully described elsewhere. Iodin can be applied by cotton applicators, by pouring on the wound, by applying with a camel's hair brush, or by using some of the commercial tubes which are so made that the iodin exudes through a gauze stopper, making combination container and applicator. Another excellent commercial tube on the market is sealed with paraffin, the tip of which can be broken off allowing the iodin to escape slowly. After using it the opening in the paraffin can be sealed by heating with a match. I have not found these commercial tubes as practicable, however, as iodin and applicator, chiefly because in large wounds one desires to quickly pour the iodin over the surface. When employees are allowed to use the iodin themselves they should be warned against rubbing great quantities of the

antiseptic into the skin or against soaking a dressing or cotton with it and binding same on the wound. The only cases of burning of the skin which the author has noted have been in the few instances where excessive amounts of the iodin have been used in this way. This use of the iodin in the departments by the employees has not caused them to cease reporting to the doctor at once for minor injuries, an argument which is often advanced against this system. When the patient reports to the dispensary, even though iodin has been applied in the department, the surgeon should again apply the antiseptic, making sure that every portion of the wound is treated. In the severer injuries this will often be very painful but the momentary pain is much better than the prolonged suffering following a later infection. Where active bleeding is present, this should be stopped by pressure with sterile gauze before the iodin is applied in order to be assured that the bottom of the wound is reached. The application of this antiseptic should be done quickly and deftly and nothing is gained by subjecting the patient to repeated applications. However, in severe crushing wounds a second treatment with the iodin should be made after the patient is anesthetized and before any operative procedure is undertaken.

Other antiseptics used on wounds for the prevention of infection include carbolic acid followed by alcohol, alcohol alone, bichlorid of mercury (1 to 1000), hydrogen peroxid, turpentine, salt solution and recently Dakin's solution or some modification of it and dichloramin-T. Carbolic acid is not a safe routine antiseptic to use and really is only indicated in bites or other places where cauterization is needed. Its use should be followed by alcohol. Bichlorid of mercury was formerly used quite extensively in emergency surgery but never accomplished the desired result as tincture of iodin has done. Hydrogen peroxid is of very little value as an antiseptic for the prevention of infections; in fact in wounds with small external openings the forceful expansion of the peroxid may carry foreign infected material deeper into the wound. Turpentine has been commonly used by employees themselves to prevent blood poisoning. It is very painful and not as efficacious as iodin. Since war surgery has demonstrated the value of Dakin's solution and dichloramin-T a few surgeons have adopted the use of these as preventive antiseptics in lieu of iodin. Dr. Lee feels that the immediate application of dichloramin-T would prevent all infections and would be a cheaper antiseptic than iodin. Experimentation is now being conducted to prove whether or not this is true. Some surgeons have advocated the use of Dakin's solution in the same way and often give their patients a bottle of this solution to pour on the dressings covering the wound at stated intervals. More actual experience is necessary before either of these

methods can be recommended and certainly before many surgeons would be willing to discard their old standby, tincture of iodin. One of the strongest exponents of this new antiseptic reported two years ago 77,000 wounds treated by the old methods with only 90 infections, while one of his colleagues reported 3500 wounds treated by the old methods with no infections. They are now using Dakin's solution and claim that it is producing splendid results. Certainly it would be hard to conceive of any better results in accident surgery than those reported by these two men when using the tincture of iodin.

It is interesting to read of the different antiseptics advocated by the various surgeons operating at the front in this war. The English speak first of carbolic acid or diluted carbolic acid, while the French extol iodin. After a year or two of the war, Wright, the English surgeon, urged the use of salt solution while Carrel, operating with the French, proclaimed Dakin's solution as the antiseptic of choice. In the fourth year of the war many surgeons have swung back to the use of tincture of iodin as the best emergency antiseptic which could be used. Every first aid kit of the enlisted medical personnel of the American Army contains tincture of iodin.

There is no question but that war wounds have developed extremely serious infections which are seldom seen in industrial surgery. These soldiers have been subjected to more terrific traumatisms, have had their filthy clothes ground into the flesh and in a great many cases have not reached the surgeon until several hours afterward, often with the parts badly infected. Some heroic method of treatment was necessary to check these infections and to overcome the excessive period of hospital treatment which was so common in the early days of the war. The reports of Dr. Carrel and other enthusiastic users of the Carrel-Dakin solution convinced practically the entire profession that the continuous use of this antiseptic in these infected areas has been one of the greatest advances made in war surgery. Recent American reports show that, as the hospitals have been pushed nearer the front and the transportation of the wounded to the surgeon has been expedited, the number of serious infections has been decreasing. It is conceivable that if these patients could be treated immediately by the surgeons, the elaborate Carrel-Dakin method would be needed only in the exceptional cases.

In accident surgery in industry the injured either receive this immediate care by the surgeon or medical care is very shortly given. If, combined with this, tincture of iodin is applied to the injured part, no matter how excessive the injury, these severe infections seldom occur and the Carrel-Dakin treatment is correspondingly rarely needed. These wounds, receiving the immediate surgical attention and the early application of an antiseptic, have been successfully closed in the

majority of cases without subsequent infection developing. This treatment, with its accompanying careful repair, is certainly much wiser than to insert a number of tubes into the wound and start the constant irrigation with the Carrel-Dakin solution, for, as stated above, experience has proven that the majority of such cases healed rapidly and with primary intention. I do not believe that Dr. Carrel himself, would advocate any other line of treatment. However, when any of these wounds show signs of infection or when, because of neglected early care, the surgeon is confronted with a seriously infected case, the Carrel-Dakin solution may very wisely be employed.

The point I am trying to make is that the judgment of the surgeon in industry must not be warped by the new methods developed for the more serious war injured. On the other hand, war surgery has developed many new measures which will improve the technic and efficiency of all accident surgery and the surgeon in industry must develop a keen judgment in deciding which of these measures is an improvement or is essential and which of them is unnecessary when the nature of the case and the quicker methods of handling it are considered.

In this connection the author desires to publish a report of three cases with comments on each, which emphasizes the value of tincture of iodin, which Dr. Charles A. Lauffer of the Westinghouse Company gave to him recently:

"1. Charles W., L6-42.

"Injured 6/18/17, resumed work 10/15/17.

"Mode of Accident.—While standing on a ladder to repair a line, reaching to the right, patient threw out his left foot to balance himself. This foot came in contact with a 36″ fan, driven at high speed, employed for ventilating, located near the roof in P-2.

"Extent of Injury.—Patient was on the operating table at Braddock General Hospital within an hour of the injury. He was reluctant about giving his consent for the amputation of the first and second toes, until a mirror was provided, enabling him to see for himself the extent of the damage on the plantar surface of the foot, and the comminuted fractures of these toes. Not only were all the tissues ground from the plantar surface of these two toes, but from the sole of the foot two inches beyond the insertion of these toes.

"Surgical Treatment.—Tincture of iodin was used at once. Very tenacious black dirt was inground, making it necessary to use the scissors, in addition to gasoline and tincture of iodin in abundance, in cleansing the lacerated tissues. It required an hour to clean the wound, and another half hour for the operative procedure. The bones were sacrificed from the big toe and the second toe, and the dorsal and lateral skin of these toes, as much as remained of it, was employed to

cover in the defect on the sole of the foot. Tincture of iodin was employed to excess and an iodoform drain was inserted at the time of operation.

"Comment.—We expected to employ Dakin's solution subsequently, should infection set in, but this was not required. A staff member, a railroad surgeon, present when we operated the case, remarked: 'What an excellent case on which to try out Dakin's solution. Put in tubes, do no washing nor cleaning, just bandage it up; continue the Dakin solution until the slough has separated.'

"This recommendation was abhorrent; by cleansing and closing the wound, we avoided the implantation of infection, and within 24 hours, had a comfortable, well pleased patient on the high road to recovery; results justified the procedure followed.

"*X*-Ray No. 1025 exhibits fractures of all five metatarsals, and the middle phalanx of the third toe; it was this extreme traumatism, not suspected at the time we operated his toes, that retarded his complete recovery.

"2. John P., SK-323.

Injured 7/17/17, discharged cured 8/7/17. Patient was a Greek, joined the army, and is now in camp. He is fully recovered.

"Mode of Accident.—Patient loaded sheet iron on small cars, drawn by motor trucks. The sheets in this instance extended out beyond the end of the car on which it was loaded. The motor truck slid in crossing slippery dinkey tracks, and the end car was switched around, the sheet iron striking the patient, while he stood in a narrow doorway where he could not escape.

"Extent of Injury.—The external ham string tendons and muscles were completely severed in two places about an inch apart, in the popliteal area and the outer aspect of the thigh; the wound was very dirty, so was the patient's skin. The large vessels were not cut.

"Surgical Treatment.—Tincture of iodin was applied and the patient was removed at once from the Works Dispensary to the Westinghouse Ward in the Braddock General Hospital, Braddock, Pa. Vicinity of the wound was carefully shaved, and cleaned with gasoline, then tincture of iodin was lavishly used in and about the wound. Severed tendons, muscles, and fascia were approximated with catgut sutures, which also controlled the bleeding. The fascia lata could not be entirely approximated, but nature evidently filled in the defect. Iodoform gauze drain was inserted, to care for oozing, and leg was dressed in fixation dressings, at approximately 10° flexion. There was no infection at any time, and the patient was comfortable; healing was nearly as rapid as in a surgical, non-traumatic wound.

"Comment.—We are of the opinion that the immediate use of tincture of iodin gave us superior results, and the preliminary use of

Dakin's solution before closing the wound would not have been justifiable.

"3. Alfred Jackson, K20-107.

"Injured 9/20/17, still under treatment.

"Mode of Accident.—First day at work, had been on the job just 3½ hours. A terminal fell behind the carriage of a milling machine. Without stopping the machine, he reached behind the carriage for the terminal; the carriage drew his forearm against the saw.

"Extent of Injury.—The saw lacerated the soft tissues of his forearm, severing all the muscles and other structures, exposing both bones of the forearm. Severe arterial hemorrhage.

"Surgical Treatment.—Tincture of iodin applied. Tourniquet applied to the arm did not adequately control the squirting arteries. Four bleeding points were sutured in the works dispensary. Tincture of iodin was freely used, and he was sent to the Westinghouse Ward in the Braddock General Hospital, Braddock, Pa.

"Foreign matter was removed from the wound, the muscles and fascia were approximated with catgut sutures; the median nerve was also sutured. The surgeon was too busy suturing to count the number of muscles that had to be united, nor did he count the number of buried sutures.

"The wound has healed kindly, there has been no pus. He has a fair functional recovery of the use of the hand, but he has not yet sufficiently recovered strength in the hand to be able to resume work.

"Comment.—When such a wound can be treated the hour of the injury, the use of tincture of iodin as an antiseptic permits of closing the wound. Even should infection arise, which is always a possibility, —though infection is a rare occurrence, when rubber gloves are used and antiseptics are freely employed—the wound can be opened, drained, and Dakin's solution resorted to, to control the infection."

The general and local measures employed in the immediate emergency care of the patient have a very direct bearing on the prevention of infections.

Rest is one of the most essential preventive measures. By rest the body is enabled to overcome the shock and general injury which it has received when an accident occurs and can thus more rapidly recuperate those body forces necessary to combat the invading bacteria.

Thus the gentlest manipulation of the injured member with early immobilization is required to give this needed rest. In the severer injuries rest for the entire body should be afforded as soon as possible. Comfort, warmth and nourishment are necessary adjuncts to the rapid recuperation of the body forces.

When it is necessary to remove the clothing to expose the injured

region the same should be cut away rather than the slower and more painful method of undressing the patient.

The cleansing of the wound is another important preventive measure. No injured part should be unnecessarily handled in securing this cleansing. Neither should any method be employed which would tend to grind dirt or other infected material deeper into the wound. For this reason, washing the wound with soap and water or with bichlorid solution, or other lotion is practically obsolete. The author has frequently seen nurses and surgical assistants, especially the latter when they are lay assistants, and even the enlisted medical personnel in the army wash open wounds with water, then with bichlorid, then with alcohol, dabbing at them and otherwise abusing the injured tissues until it is no wonder that infections occur. One of the most essential things to teach these assistants is to leave these wounds alone. Even many surgeons have yet to learn this lesson. Bleeding should not be checked immediately in any wound as this usually is nature's method of washing it out. After painting the injury with tincture of iodin the adjacent skin can best be cleansed with gasoline, benzin, or alcohol. If the dirty skin about the wound is thoroughly painted with iodin even this cleansing is not necessary. However, the patients often feel that their injury is neglected if the adjacent surface of the body, especially that portion immediately under the dressing, is not cleansed. I never dress a fresh wound without carefully explaining to the patient my reasons for not washing it with soap and water, or otherwise insulting the parts. Taking the patient into your confidence and explaining such details as this is one of the best ways of securing his co-operation and is a procedure in emergency surgery which is too often neglected, especially by the young surgeon, fresh from hospital or dispensary training. When a wound occurs in the hairy parts of the body, shaving should be a routine cleansing measure. Before shaving the hair next to the wound it should be painted with iodin. A sharp razor should be used so that dry shaving can be done. Always shave away from the wound. Any loose hair falling into the wound should be carefully removed with sterile forceps.

All foreign material which has entered the wound should be removed. This should not be done until the wound has been treated with tincture of iodin and then should be accompanied with the least possible manipulation of the injured tissues. The probing of wounds with the finger is a dangerous practice and in the few cases where necessary a sterile rubber glove should always be worn. When the entering wound is small and one is convinced that infected material has been carried into deeper tissues the opening should be enlarged and the foreign material carefully removed by sterile forceps. When small pieces of steel or bullets penetrate the body these should be

carefully located by x-ray before an effort is made to remove them, unless their location is so evident that the operation can be readily performed. Many such small pieces of foreign material enter the body and never cause any trouble if proper sterilization of the tract is accomplished. In fact, meddlesome interference in these cases is often more harmful than if the part was left absolutely alone. Here again the keenest surgical judgment is necessary and is only developed by experience. In accident surgery in industry the foreign materials usually penetrating the tissues are splinters, particles of clothing, pieces of steel or pieces of a tool which broke off after penetrating the body, such as a needle—so common among garment makers. The removal of these materials is usually essential to the prevention of infections.

All loose tags of skin or other soft tissues so damaged that they are bound to become necrotic should be trimmed away. If the wound is seen after several hours and has been caused by an object which undoubtedly will cause the tissue to become infected, the tract of the wound may be thoroughly dissected, sterilized and closed as is being practised in war surgery to-day. As a general rule, however, every effort should be made to save all of the soft parts so as to better facilitate closing and healing. When loose particles of bone which have been deprived of periosteum are scattered about the wound these should be removed. Bone adherent to the periosteum should be replaced.

Drainage is a very essential factor in the prevention of infections and when to and when not to insert drainage into a wound requires most careful consideration on the part of the surgeon. As a general rule, incised wounds which have been treated with iodin or similar reliable antiseptic can be closed without drainage. Extensive lacerated wounds even though treated immediately with an antiseptic can be closed but only after drainage is established. Severe crushing wounds or deep penetrating wounds after sterilization should only be partially closed, sufficient opening being left for the introduction of good drainage. Wounds already showing signs of infection should never be completely closed and thorough drainage is usually indicated. An exception to this may be in the case of small incised wounds, mildly infected, which can be thoroughly sterilized and then closed with only small drainage provided.

Many kinds of drainage material are used. In large wounds rubber tubing or a section of tubing, twisted rubber or gutta percha are best adapted for drainage. In many cases, especially if hemorrhage is profuse, gauze is required but as a rule gauze drainage tends to act as a pack and defeats its own purpose. Plain sterile gauze is now used for drainage just as often as iodoform gauze, formalin gauze or other such chemically treated material. In smaller wounds a small rubber

band, or two or three strands of silk gut twisted together, affords excellent drainage.

The question of closing the wound often plays an important part in infection prevention. Many wounds which were formerly left open are now treated with iodin and then carefully closed without ever becoming infected, whereas if left open healing is delayed and the dangers of subsequent infection increased. Careless coaptation of the tissues, leaving dead spaces in the tissues below the skin have frequently resulted in infections. Over-zealousness in coaptation may shut off the blood supply and cause necrosis of the edge of the wound followed by infection. Frequently one sees a good surgeon, who otherwise has the most perfect technic in the operating room, suturing one of these emergency cases without observing any of the finer points in asepsis. A wound which is to be closed by sutures in the office or the dispensary should be carefully sterilized, surrounded by sterile gauze or a small sheet, resembling a miniature laparotomy sheet, and treated only after the hands and instruments have likewise been sterilized. Sterile suturing material should be used and should not be allowed to drag across unclean portions of the patient's body while being inserted.

Tetanus (Lockjaw).—This infection, due to the *Bacillus tetani* is one of the most feared complications following injuries. In order to prevent this infection some surgeons have advised the injection of an immunizing dose of tetanus antitoxin in all punctured or lacerated wounds. Ten years ago this prophylactic measure was used quite extensively in industry. However, with the increased use of antiseptics and the more immediate treatment of wounds by the surgeon antitoxin has become less necessary. In the first year of the war many soldiers died of lockjaw. To combat this, antitoxin was administered at the first aid station farthest front. The wonderful results obtained by the use of this prophylaxis proved the great value of antitoxin. These wounds were practically all soil infected.

In industry it is only the occasional wound which is soil infected. The patient whose foot is crushed by an automobile or a truck on the street is a logical case for antitoxin but the foot crushed by machinery or falling timber in the plant or even by the locomotive on the railroad track where the dirt consists chiefly of cinders, is very seldom in danger of developing lockjaw providing thorough sterilization with iodin can take place within the first hour. We must not think it necessary to give every industrial wound an immunizing dose of tetanus antitoxin when we once more return to our private work. Here again the judgment of the surgeon must not be warped by our experience in war surgery. Nevertheless we will all be more faithful

in administering it in the suspicious cases where soil infection makes lockjaw imminent.

In the author's experience, antitetanic serum as a prophylaxis was only administered routinely during the first year of his emergency surgery. No cases of lockjaw developed during that year and neither have any cases developed among the employees under his care during the succeeding nine years. His predecessor in the same industry used tetanus antitoxin on every puncture wound due to nails and on all severe lacerated wounds. The records show that three cases of tetanus developed during the period he was in charge. I am convinced that in this industrial work the thorough sterilization of the wound by tincture of iodin makes the need of the immunizing dose of antitoxin practically unnecessary, thereby limiting its use to the occasional soil infected case.

When the immunizing dose is given it consists of from 500 to 1000 c.c. of antitoxin injected subcutaneously above the wound. Some insist on injecting it directly into the nearest nerve trunk.

Hemorrhages.—Hemorrhage is another complication, especially in extensive wounds, which it is always necessary to prevent. This is accomplished by firmly packing the wound or by applying a thick sterile gauze dressing and firmly binding in place or by clamping the bleeding vessels with clamps left on for several hours, or by the direct application of ligatures to the bleeding points. When ligatures are necessary in the emergency treatment of these extensive wounds it is well to leave their ends long in order to easily locate the bleeding vessels in case of subsequent hemorrhage. At times it may be necessary to use a tourniquet for two or three hours in order to control and prevent subsequent hemorrhage. Such a continued use of the tourniquet should always be under the direct supervision of the surgeon and great care should be exercised to prevent subsequent gangrene.

Deformity.—Deformity naturally is more often due to the severity of the wound and to that extent is beyond the control of the surgeon. But in every case the physician must begin thinking of the prevention of undue deformities at the time he administers the emergency treatment and must continue to constantly think along these lines during the subsequent treatments. Many a case of deformity can be prevented by immediately restoring the limb to its proper position whereas if this is left for some future treatment permanent damage may have occurred. In preventing infections one is likewise preventing the dangers of deformity.

COMBAT IMMEDIATE COMPLICATIONS

Impending Death.—In emergency surgery the physician faces some of his greatest battles against impending death and many a case is

saved by the experienced surgeon who does nothing with the wound in such a crisis but devotes his entire attention to assisting the patient to overcome the terrific shock which is threatening his life. On the other hand many a case is lost in this critical moment by manipulating the injured part or attempting surgical procedures before this shock is overcome. This can best be illustrated by two cases which the author observed in two different hospitals during the same day:

Case One: A man was carried into the hospital after being run over by a street car. His left thigh was crushed to the hip-joint and was held in place only by the gluteal muscles. There was a warm bed in the receiving ward held in readiness for such shock cases. After cutting the trouser leg away from this wound the surgeon simply clamped the femoral vessel which was exposed but not bleeding and then covered the wound with a large sterile pad and immediately placed the man, with his clothes on, in the warm bed. No further attention was paid to the injured part, but by means of salt solution intravenously, hot coffee per rectum and stimulants the shock was combated for the next ten hours. The wound was watched carefully for possible hemorrhage following the use of the stimulants and salt solution but only once was it necessary to apply an additional artery forceps. After the immediate danger of death was overcome the wound was sterilized by pouring iodin over it but no other effort was made toward repair until all signs of shock were overcome. Twelve hours later the patient was subjected to a hasty amputation at the hip-joint under ether anesthesia but no time was consumed in endeavoring to carefully coapt the various layers of tissue. This was left for a subsequent operation when the patient's condition warranted it. This man made an excellent recovery without infection.

Case Two: That night the author was called to another hospital to see a man who had been run over by a nearby street car and who was immediately carried to the hospital. This patient had likewise suffered a severe crushing wound at the hip-joint and in many respects was almost identical with the other case. The patient had been immediately carried to the operating room and the physician who was called in to give emergency care had started combating the shock but at the same time had proceeded to give surgical attention to the wound. The patient's body and right limb were covered with blankets and hot water bottles were in place. Normal salt solution was being administered intravenously, stimulants had been given. While the patient was being anesthetized with ether, the physician had proceeded to cut away the mangled limb and was carefully coapting the various tissues. I arrived at this stage and recommended the immediate application of a large sterile pad to the stump, leaving subsequent

repair to some future date if the patient recovered. This was doubtful considering his condition at that moment. Before this recommendation could be acted upon the patient died.

Too much emphasis cannot be placed upon the importance of combating these severe shock conditions before attempting any radical emergency treatment of the wound itself. The surgeon must have the patience of an obstetrician in such cases and stick by the patient, biding the time till it is safe to proceed with the repair work.

Shock and Hemorrhage.—Shock and hemorrhage, either singly or combined, play an important part in the complications which an emergency surgeon must combat immediately following an accident. There are all grades of both shock and hemorrhage and both may occur immediately (primary) or late (secondary or delayed). Both may gradually lead to a condition spoken of as "collapse" and death may follow this state.

Previous to the war these conditions were most thoroughly described by Crile and his methods of treating them have played an important part in the treatment of our soldiers affected by these conditions. During this period of war surgery, research in the field of shock and hemorrhage have added considerably to our knowledge of these subjects and the emergency surgeon in industry should familiarize himself with these various reports from the war zone in France.

One of the interesting contributions of the physiologic changes which take place in the body during traumatic shock has appeared recently in the report from the Central Medical Department Laboratory of the American Expeditionary Forces in France, under the title of "The critical level of a falling blood-pressure and the modifications of hemorrhage."

"Clinical and experimental observations have shown that death after severe hemorrhage is not immediate, but may occur after the lapse of some hours. This fact is explained by the gradual damage of essential organs by partial anemia until they fail to perform their functions. If hemorrhage is repeated, non-volatile acid (lactic) will appear in the blood. Other conditions which markedly lessen the oxygen supply to the tissues (CO poisoning, rebreathing expired air), have the same effect. Lactic acid thus produced unites with the sodium of the sodium bicarbonate in the blood, drives off CO_2, and thereby produces a reduction of the "alkali reserve" (indicated by a diminished capacity of the plasma to take up CO_2). When the CO_2 capacity is reduced to less than 50 volumes per cent., under standard conditions, "acidosis" is said to be present. Reduction of the alkali reserve in such circumstances, may be taken as an indication of insufficient oxygen supply to the tissues.

"As arterial blood-pressure falls, the rate of circulation of the blood decreases. Then, though the red blood corpuscles leave the lungs normally laden with oxygen, they may not carry a normal supply to the tissues because they move too slowly. In that case the condition would be similar to other conditions in which oxygen want exists; non-volatile acid would result, and the alkali reserve be lessened.

"In traumatic shock the blood-pressure is low and the circulation is therefore sluggish. For therapeutic purposes, it is important to know at what point in a falling blood-pressure, the oxygen supply begins to be insufficient, as indicated by a lessening of the alkali reserve.

"Experiments in the Laboratory of Surgical Research at the Central Medical Department Laboratory have shown that if arterial pressure is lowered to 80 mm. of mercury for an hour, the alkali reserve is not reduced; but if lowered to 70 mm., the reserve begins to fall; and if lowered to 60 mm., it falls still faster (*i.e.*, the oxygen supply is less adequate, and the production of non-volatile acid is more rapid). A critical level of oxygen supply to the tissues is reached, therefore, when the arterial pressure is experimentally lowered to less than 80 mm. of mercury. Average figures from 43 cases of shock and hemorrhage studied last summer at Bethune reveal in human beings similar relations:

Systolic blood-pressure, mm. mercury	Average CO_2 capacity, vols. per cent.	No. of cases
90–100	49	12
80– 90	49	5
70– 80	43	10
60– 70	36	11
50– 60	24	5

"As these figures clearly show, a reduction of the alkali reserve below 50 volumes per cent. CO_2 capacity, or a condition of "acidosis," occurred when the systolic pressure was lower than 80 mm. of mercury; and the reduction of the reserve was progressive as the pressure was progressively lower. It appears, therefore, that the critical level for proper oxygen supply to the tissues is approximately 80 mm. of mercury, systolic arterial pressure. The lower the pressure below that level, the less is the circulation able to meet the needs of the tissues.

"Experiments show, as might be expected, that if hemorrhage complicates a low blood-pressure, the critical level is higher than if no loss of blood has occurred. Thus, if 20 per cent. of the blood has been lost, the pressure cannot be lowered to 80 mm. without indications of insufficient, oxygen supply to the tissues.

"In the treatment of shock and hemorrhage, the persistence of

arterial pressure below 90 mm. of mercury for more than a half hour, without sign of improvement, though the patient has been warmed and rested, should call for treatment by transfusion of blood or the infusion of acacia solution. If the pressure is much below 90 mm., *e.g.*, 50 or 60 mm., such treatment should be instituted immediately."

The symptoms of shock are most graphically described by John J. Moorhead as follows:

"A typical case presents rather a characteristic appearance in that the patient immediately after the accident is unconscious or nearly so; the surface of the body is pale, cold and sweaty; the expression is anxious; the eyes are shut or widely open; the pupils are dull, usually dilated, and slowly responsive; respiration is shallow and feeble and often intermittently sighing; the pulse is weak, compressible and irregular, and often slow and inactive; if very arousable, mental torpidity is the rule; sometimes the sphincters are relaxed and nausea and vomiting may occur; the temperature is subnormal or slightly elevated at first. After some minutes, or later, these patients gradually become aroused, the color returns, the mind clears, the pulse and respiration strengthen, and they recover."

Other much more severe grades may remain in a state of mental and physical depression or mental torpor for many hours and even die in deepening coma from shock alone, although death from this source independently is quite rare and should not be accepted as a sole cause in the absence of an autopsy.

In some instances a condition of apathy is replaced by one of irregular activity of a somewhat delirious type, this occurring especially with head injuries and with alcoholics; this is a so-called erethistic as distinguished from the apathetic or ordinary form, and it is very closely allied to traumatic delirium.

Secondary or delayed shock may appear from several hours to two or three days after an accident. It is most frequently due to hemorrhage or may appear after an anesthetic operative procedure has been undertaken.

Hemorrhage gives almost the same symptoms of shock especially as the two so often occur together. A patient without much shock, however, who is hemorrhaging, will gradually develop these symptoms. Increasing pallor is noticed; the pulse becomes soft and compressible, at first rapid but gradually becoming slower and irregular; the patient yawns frequently and complains of thirst; the blood-pressure becomes lower and lower. Unless the condition is checked a state of collapse gradually develops, followed by coma and death.

Secondary or delayed hemorrhages frequently occur in accident surgery and in severe injuries the surgeon should constantly be on the lookout for the above symptoms.

When shock and hemorrhage are coincidental as is so often the case in those accidents diagnosed as internal injuries, it is often very difficult to differentiate between the two. It is very important to make this differentiation, however, as the treatment must frequently be modified where the two exist together. For instance, when shock alone is present, the repair work may be postponed until the patient's condition is improved, but if shock and hemorrhage are both present or if the shock is solely due to hemorrhage, the finding and checking of the source of bleeding is the paramount consideration. Often the stimulation and especially the transfusions which are administered in case of shock may increase or even create a hemorrhage. Therefore, in combating shock, one must constantly be on the lookout for hemorrhage and ready to immediately check the same. As Moorhead so aptly states, "shock patients get better, while bleeding patients often get worse during treatment and lapse of time."

The treatment of these conditions is similar after the hemorrhage is controlled. In fact the treatment of both must often be instituted while endeavoring to check the hemorrhage.

The ordinary shock patient will recover from this state very shortly by the simple methods of rest; keep thoroughly warm; no manipulation of the injured part or if necessary, the very gentlest; lowering the head, and stimulation. The severe cases demand all of the above and in addition, transfusion or infusion of normal salt solution with or without adrenalin, the infusion of acacia solution, or the transfusion of blood. The delay in administering the more heroic methods has caused a fatal termination of many a case which otherwise might have been saved. As one observer in the war zone has said, "Necessity for transfusion or infusion in cases of shock with or not the further cause of low pressure resulting from hemorrhage can be detected earlier and with greater certainty by a series of blood-pressure observations than by other means. A warmed, rested patient showing a persistent arterial pressure below 90 mm. of mercury needs help at once and the help he needs is infusion or transfusion."

In industrial surgery the majority of these shock and hemorrhage cases will or should receive their emergency treatment in the plant dispensary. They are the type of cases which formerly so frequently died in the ambulance on the way to the hospital. The bringing of the surgeon to the front line trench in industry has prevented many such deaths. The time is coming when a very hazardous industry must provide this immediate treatment.

Every plant surgeon should be thoroughly drilled in the following treatment of a patient brought to the dispensary on account of severe injuries:

1. Immediately place on a bed or on the dressing table and cover

all parts of the body except the injured portion with warm blankets, and surround the body with hot water bottles. Elevate the foot of the bed. (My surgical nurse carries out this procedure in all cases of injury whether shock symptoms are present or not, automatically attending to the comfort of the patient without any directions from the surgeon.)

2. If shock symptoms are present, administer at once a hypodermic of morphin. If the condition of shock is mild, this may be replaced by aromatic spirits of ammonia.

3. While this treatment is being carried out, carefully inspect the injured part, clamp all bleeding points, sterilize with iodin and cover with a sterile pad. Don't take time to carefully bandage. Direct the rest of your attention to combating the shock, meanwhile watching the wound carefully for a recurring hemorrhage.

4. If the condition of the pulse or the lowered blood-pressure (the nurse or an assistant has already taken the blood-pressure and continues to do so at frequent intervals) show the need of cardiac stimulation, strychnia one-thirtieth of a grain may be given, or better, adrenalin or camphor.

The author keeps two things constantly ready for shock cases, namely, a sterile glass irrigation jar containing sterile tubes with sterile needles attached for the infusion or transfusion of normal salt solution; and a fountain syringe with a large size catheter attached for the administration of hot normal salt, six ounces, and whiskey, two ounces, per rectum. While the above procedures are being carried out, the surgical nurse and her assistant sets up this apparatus and fills the first with the sterile normal salt solution and the latter with the normal salt and whiskey solution. They do this even though later their use may be found unnecessary.

5. If the shock is severe and the blood-pressure indicates its need, an infusion or transfusion of normal salt solution should immediately be given, at the same time starting the rectal stimulation. The body must not be unduly exposed but must be kept warm during this entire treatment.

6. Do not move the patient from the dispensary to the general hospital until this condition of shock has been overcome. As a rule, after three or four hours, even these extreme cases can be moved to the hospital. Gentleness and great care must attend this transportation and the surgeon should stay constantly by his patient, even riding in the ambulance with him.

Unless the danger of delaying an operation is of greater menace to the patient's life than the shock condition, all operative procedures should be postponed until the latter is overcome. The need for an immediate operation may cause the patient to be rushed to the hos-

pital at once. Contrary to the opinions of many, such a case usually stands the effect of an anesthetic very well, the patient's condition seeming to improve after the anesthetic has started. Frequently the symptoms of shock return and the condition becomes critical during the operative procedure. Crile's method of blocking the nerves above the site of the injury by injection will often prevent this recurrence of shock during an operation.

Blood transfusion has usually been considered an operative procedure suitable only for the hospital. Recent experience has proven that quick methods of blood transfusion by the use of a large hypodermic syringe containing 2 per cent. solution of sodium citrate, so that when the syringe is filled there will be one part citrate to ten parts of the donor's blood, can be administered with good effect to these hemorrhage and shock patients. Undoubtedly, one of the advances in surgery as a result of the war will be a commoner use of blood transfusion.

Resuscitation.—The method of artificial respiration for combating certain types of shock, suffocation, asphyxiation and similar conditions has been fully described in the chapter on First Aid. In addition to this, many industrial dispensaries, especially in those industries where electrical shock, gas poisoning or asphyxiation are liable to occur, have included pulmotors as a part of their equipment. Many surgeons claim excellent results from the use of these pulmotors. Universal approval of the various devices for automatically forcing respiration has not been given, some authorities claiming that this procedure is dangerous. There is no question, however, but that this method has been very successful in many cases of gas asphyxiations.

Circulatory artificial stimulation is another means of resuscitation which should be employed. Rhythmic pressure over the heart area, the tongue being drawn out, combines circulatory with respiratory stimulation, according to Crile. Some have advocated the digital rhythmic compression of the heart itself but the success of this method is very doubtful.

Freezing or Frost-bites.—Third degree frost-bites, that is, those with deep ulcerations, destruction of tissue and even gangrene, are not usually seen in industrial practice. Frost-bites of the first degree producing redness and swelling of the skin are not uncommon and some even show the blebs or blisters of the second degree frost-bites. The combating of immediate complications in frost-bites aims at the restoration of circulation. Such patients should not be taken into a warm temperature at once but gradually. Friction and cold applications afford the greatest relief. Cracked ice applied direct to the frost-bitten member and rubbed back and forth with increasing vigor is the best method.

The patient that has suffered an extreme case of freezing should be placed in a cold bath in a cold room and friction applied by cold towels. Gradually the temperature of the bath and the room is increased until the appearance of the body indicates that circulation has been re-established.

Heat Exhaustion.—Heat exhaustion is not uncommon among employees during the summer months when they must work in hot places. Heat exhaustion is really a collapse from the effects of neat.

Such a patient develops an extreme pallor; the skin is covered with a clammy perspiration; his pulse is weak and rapid, and respiration is rapid and shallow; the patient is never unconscious but may be in a state of collapse; the temperature is rarely over 103°F. and may be subnormal.

The patient should be immediately removed to a cool room, should lie down with the head lowered, the body should be covered with a blanket and aromatic spirits of ammonia administered. In extreme cases, rectal stimulation with normal salt and whiskey and hot coffee, is beneficial. Such patients usually require rest, comfort and mild stimulation to early overcome this condition.

Sunstroke.—This condition is usually caused by prolonged exposure to the direct rays of the sun or it may be due to excessive heat indoors. The symptoms develop suddenly. The face is flushed and the skin of the body is hot and dry. The temperature of the body is greatly increased, ranging from 103°F. to as high as 109°F., even more in fatal cases. The pulse is rapid and bounding, later followed by a weak, irregular pulse. At first the respiration is stertorous, later becoming rapid and shallow.

The treatment in this condition consists in reducing the temperature of the body as quickly as possible. It is done by ice water sponging or by placing the patient in a cold bath the temperature of which is gradually decreased by the application of ice. This is kept up until the body temperature is lowered and consciousness returns. On the first indication of the return of high temperature this treatment should be repeated. After the patient is placed in bed ice bags should be placed on his head. A very sudden drop in temperature usually indicates a fatal termination. At the same time the collapse must be treated by cardiac stimulation, strychnia and caffein being most commonly employed, and by the use of salt solution and whiskey per rectum.

Every industrial dispensary should be equipped for the emergency treatment of both heat exhaustion and sunstroke. After a fatal case of sunstroke, the author had a bath tub installed in both the men's and women's toilets in connection with the doctor's office.

These have only been needed in two cases of sunstroke since their installation but both cases were saved.

The combating of the immediate complications in the three last named conditions makes up a definite part of the emergency surgeon's work in industrial practice.

TEMPORARY AND PERMANENT RELIEF

The majority of emergency surgery in industry consists of the immediate permanent treatment of wounds, the patient returning to work, and reporting to the doctor's office for his subsequent treatment. In some cases the permanent relief will be given at the dispensary and the patient is then sent to his home or to a hospital for the subsequent treatment.

Many employees receiving fractures, severe lacerations, crushing wounds and loss of members will be given temporary relief at the dispensary and then sent to a hospital where the permanent repair is given in surroundings better adapted to major work.

Emergency surgery administered for either the temporary or permanent relief usually involve the following methods:

Closure of Wounds.—Consideration was given to this procedure under the subhead of preventing infections. As a rule, the incised wounds and the majority of lacerated wounds received by employees can be closed after sterilization has been done. Many of these cases will require a small rubber band, a wick of gauze or two or three strands of twisted silk gut for drainage, the same to be removed after twenty-four or forty-eight hours. The majority of penetrating wounds and even the severe, crushing wounds, after sterilization, the removal of all foreign bodies, and the repair of the deeper tissues, can be closed providing the doctor receives these cases early. In many of these, small drainage is often indicated. As a general rule, the compound fractures should be sterilized, thoroughly drained, and not completely closed. The treatment of such wounds, as developed by war surgery, is described under the chapter on Fractures.

The commonest method employed for the closure of wounds is that of suturing with catgut, horsehair, silkworm gut, or silk and linen, all thoroughly sterilized. Catgut is almost universally used in the repair of deeper tissues. Some use it in the skin but a majority of the surgeons prefer non-absorbable material. The author has used catgut for the closure of many skin wounds and when iodin was used religiously, has never had any difficulty with infections. As a routine measure, however, silk, linen and horsehair are best employed in emergency work.

During the last five years, the author has not employed suturing in more than 10 per cent. of his cases. Narrow strips of adhesive

plaster will coapt the skin edges of a wound as thoroughly as suturing, except in those regions where considerable tension is brought to bear upon the skin as in the movement of a joint. The method for the closure of wounds by adhesive plaster is as follows:

1. Adhesive plaster is cut in one-quarter inch strips and in lengths varying from one inch to eight or ten inches depending on the location of the wound.

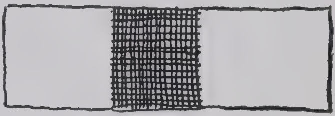

Fig. 78.—Strip of adhesive plaster sterilized with iodin at point of contact with wound. Used in place of suture.

2. That portion of the adhesive plaster which comes in direct contact with the wound is thoroughly painted with tincture of iodin and allowed to dry. Care is exercised in not touching the middle portion of the strip thus sterilized. (See Fig. 78.)

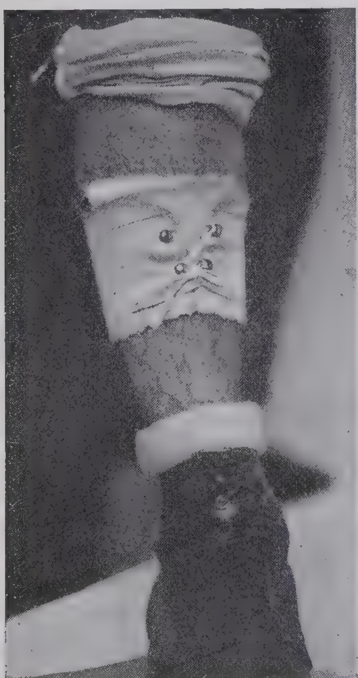

Fig. 79.—A cotton bandage, cut to the circumference of the limb, edges bound with adhesive plaster into which eyelets are fixed, and a tape for lacing affords a rapid method of bandaging.

3. The wound which has previously been sterilized with tincture of iodin is held together by the sterile fingers of the left hand while each adhesive strip, which has previously been attached to the skin on one side of the wound, is drawn snugly across and attached to the skin on the other side. Additional strips are thus applied until the wound is completely closed. A quarter of an inch space is left between each strip. This allows for the natural oozing of the wound. (See Fig. 79.)

4. Tincture of iodin is now painted over the adhesive strips.

5. A sterile dry gauze dressing is placed over the wound and adhesive strips.

6. In large wounds with considerable gaping where it is difficult to coapt the edges or where tension would ordinarily indicate the use of tension sutures, a small roll of sterile gauze can be placed on either side of the wound and a longer and wider strip of adhesive plaster can be drawn tightly over these so as to cause inward pressure on the wound by the gauze rolls.

Adhesive strips are of no value when moist dressings are to be applied to the wound.

The greatest value of adhesive strips over the old method of suturing is in the psychologic effect on the employees. Previously, workmen, especially foreigners, would stay away from the doctor's office for fear their incised wound would be stitched. Some time ago the author overheard an employee who had just received this adhesive plaster treatment, remark to a fellow employee, "Say, those docs. up there are all right. They don't butcher a fellow all up or stick a needle through every little cut like that doctor at the mill used to do. I won't be afraid to go up there any more." Such favorable propaganda as this, spread throughout the working force, increases the usefulness and value of the doctor's office.

Metal clamps of the Michel type are used by some plant surgeons but even when not painful, they have an unfavorable psychologic effect upon the employee.

The closure of wounds by sealing them up with collodium is a dangerous practice. The wound secretions, clogged up under the collodium dressing, often form a favorable seat for infection. One foreman objected to his men losing so much time in going to the doctor's office to have minor wounds properly attended to. He procured a bottle of hydrogen peroxid and another bottle of collodium and some cotton, and proceeded to care for these minor cuts and abrasions himself. Two serious infections shortly occurred among the employees treated by him. He was not discharged but the management published his folly broadcast throughout the plant and such individual efforts as these immediately ceased. Further, foremen were more keenly alive to the importance of sending these minor cases to the doctor's office.

Great care should be exercised in the closing of wounds to prevent scar formation, especially on the face or exposed portions of the body. In linear wounds, the adhesive strips will cause healing with less of a scar than where sutures are used. However, in jagged wounds on the face, stitches should be employed in order to secure less of a scar. In such cases, fine horsehair is the best material.

Fainting.—Fainting is very prone to occur during this minor emergency surgery. It is best to have patients lie down when their wounds are being closed. If they are allowed to sit up, they should be carefully watched, and if pallor, clammy perspiration, dilated pupils, yawning, or a complaint of dizziness or blindness is made, they should immediately lie down. Often when the dressing can best be accomplished by the patient sitting up, if any of these signs are noted, the faint can be avoided by having the patient lean over with his head between his knees. A few whiffs of aromatic spirits of ammonia or even a

drink of water will prevent many faints. Such patients should be given plenty of fresh air. When a person faints in the dispensary, the other patients must be carefully watched as frequently two or three of these may topple over. I have seen several ugly scalp wounds received by patients allowed to fall in faints and for this reason caution should always be taken to prevent them. I have always insisted that the patients who faint in the dispensary, must lie down for a few moments in the rest room before returning to work.

Immobilization.—The importance of the immediate immobilization of fractures is brought out in the chapter on the same. For this purpose, several different types of splints should always be on hand.

In severe incised, lacerated wounds or crushing wounds near joints, the member should be immobilized with a light splint in order to put it absolutely at rest. This will not only prevent the wound from being torn open by movements but is an excellent means of preventing infection.

All sprains should be immobilized. This can be accomplished by the use of splints, but often binding by two or three layers of adhesive plaster will afford the necessary rest for the part. In applying adhesive plaster to the skin, all hair should be carefully shaved away. It is inexcusable for any surgeon to apply adhesive plaster over a hairy area, even though it be the few hairs found around the foot and ankle, and cause thereby the needless pain to the patient when the same is removed. In some cases a cotton or flannel bandage can first be applied over the sprained joint and this can then be reinforced by adhesive plaster strips. If swelling of the part is anticipated the adhesive strips should not meet in the middle line.

In extensive injuries to the soft parts of the upper extremity both immobilization and rest can be gained by the use of the triangular sling. Often, rest in bed with sand bags placed on either side of the injured member, affords the best method of immobilization and rest. This is well illustrated in the case of hand infections where immobilization of the entire upper extremity is very important for rapid recovery. The patient should be put to bed with the arm extended at an angle of 45 degrees from the body. A rubber sheet is placed under the arm and hand to protect the bedding from the moist dressings. A folded woolen blanket is placed under the arm and hand, hot dressings are then applied from the hand to the elbow, or if indicated, completely to the axilla. Sterile bath towels soaked in hot boric solution make an excellent hot dressing and can be readily wrapped around the entire arm and hand. The woolen blanket is then folded over the hot dressings. Two or three hot water bottles can be placed about the blanket, and the rubber sheet is then folded over the entire dressing so that the arm and hand are thoroughly

encased. This usually accomplishes complete immobilization but if necessary, a sand bag can be placed on either side of the member to hold it more securely.

The various things commonly used for immobilization are bandages, adhesive plaster, various sized pasteboard or wooden splints carefully padded, plaster of paris splints or casts, blanket splints, pillows and specialized splints as the Hodgen arm or leg splints, or the commercial splints.

Dressings.—The rule "report to the doctor's office no matter how slight the injury" brings many cases with such minor injuries that a dressing of any kind is unnecessary. The doctor should not make light of these cases but carefully paint with iodin and explain to the patient why no dressing need be applied.

Fig. 80.—A severe laceration of the hand closed with adhesive strips after first sterilizing the wound with iodin.

Fifty per cent. of the dressings will consist of a dry sterile gauze applied and held in place by a gauze bandage. The surgeon must remember that the smaller the dressing and the fewer the joints covered by same, the less is the efficiency of the worker interfered with. Absorbent cotton should not be applied next to wounds for reasons already given.

Moist dressings are chiefly indicated in infected wounds or in abrasions where they are used to prevent the dressings from adhering. The commonest moist dressings are boric, saline, bichlorid of mercury or alcohol. Recently moist dressings of Dichloramine-T or of the Carrel-Dakin solution have been advocated by different emergency surgeons.

It is unwise to use strong antiseptic moist dressings on any wounds as the adjacent skin will invariably become irritated and more prone to infection. Occasionally a physician will apply a moist dressing of weak carbolic acid solution with the result that when the dressing is removed the underlying skin has a characteristic pallor

and the capillary blood supply is destroyed. Or a physician or a patient may pour iodin on a gauze dressing and bind it on the wound. Severe burns often result from such treatments. In fact, iodin applied to a wound should be allowed to dry before applying the dressing.

In threatened wound infections, especially about the fingers or toes, and for moist dressings in ambulatory infected cases, the author relies especially on equal parts of alcohol and glycerin. For example, the finger has been punctured. The employee neglects the wound but reports the next day with the finger slightly swollen, reddened about the injury and very tender. No sign of pus is present and it is not indicated to open the area. A fairly large pad of sterile gauze

FIG. 81.—Paraffin treatment of burns: *a*, Sponging wound with Dakin's solution.

is soaked in the alcohol and glycerin and immediately wrapped around the finger. This is covered with gutta-percha so that the dressing is practically air tight, and is then bandaged in place. Such a dressing is reapplied every twelve hours. Usually by the next day the threatened infection has been aborted.

Another moist dressing which is very valuable especially in ambulatory cases is composed of a solution of magnesium sulphate and glycerin. This is expecially adapted to abrasions or old chronic, ulcerated areas where granulation must be stimulated.

Dusting powders are chiefly used in abrasions, small first degree burns, or when the skin has become irritated. Bismuth subnitrate is the most soothing powder which can be used. The wound area may be gently covered with sterile olive oil and the bismuth powder

applied over this. Bismuth subiodid, powdered oxid of zinc, boric powder, powdered calomel and iodoform are powders most frequently used by surgeons.

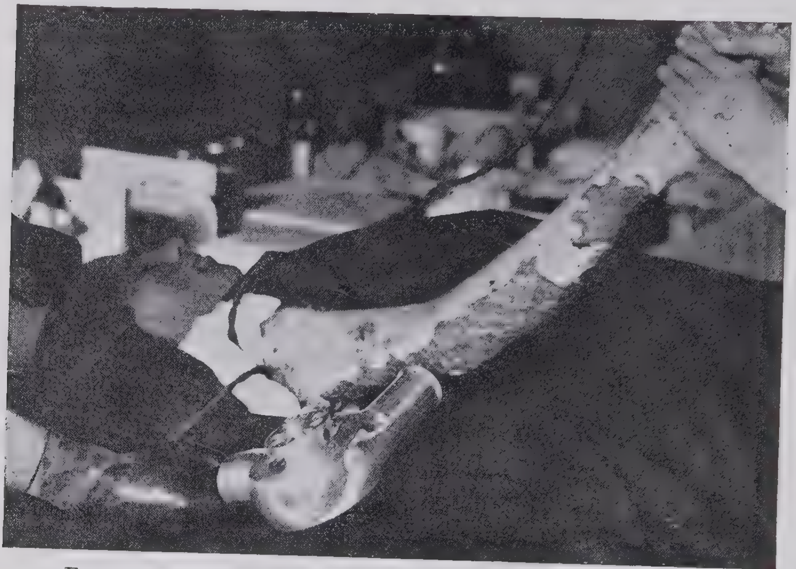

FIG. 82.—Paraffin treatment of burns: *b*, drying with hot-air blast.

FIG. 83.—Paraffin treatment of burns: *c*, spraying melted and medicated paraffin on wound.

Ointments are occasionally applied to the irritated skin or more frequently to large, denuded areas after "weeping" has ceased. Dr.

A. I. Bouffleur advocates the use of equal parts of balsam of Peru and castor oil as one of the best ointment dressings which can be used over these chronic, denuded areas. It stimulates granulation and prevents the dressing from adhering. Chronic abrasions over the shin bone where ulceration so easily occurs, require such a dressing. Unguentine, although a proprietary ointment, is one of the most useful about the dispensary. It affords an excellent dressing for recent abrasions or burns and also stimulates healing in these chronic conditions. Mercurial ointments, such as white precipitate, is an excellent dressing where antiseptic action is desired.

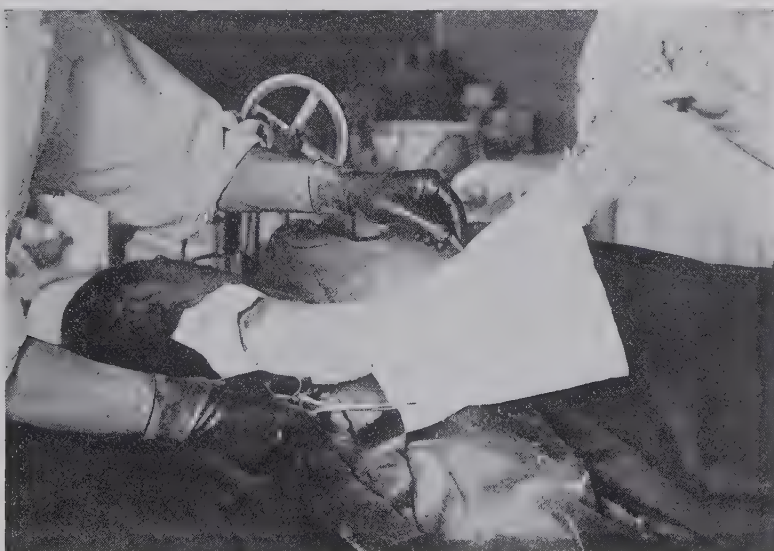

FIG. 84.—Paraffin treatment of burns: *d*, applying thin cotton over the paraffin film.

Carbolic salve is chiefly used by the laymen. Every patient should be warned against applying carbolic salve to a wound and covering it with a dressing. Some very serious cases of necrosis have followed this practice. A girl employee scratched her little finger and it became slightly infected. She reported to the doctor's office where a moist dressing was applied. That night her mother removed the dressing and put on a large quantity of carbolic vaselin, then again bandaged the finger. She kept the girl home the next day under the same treatment. The following day the patient reported to the doctor's office with the finger blanched and shriveled. Within twenty-four hours, a dry gangrenous condition developed and continued until the first two joints of her finger practically dried up. This young lady has a perfectly useless fifth finger as a result of the carbolic ointment.

The open treatment of wounds is becoming more and more popular. Abrasions and burns, chronic ulcerated conditions and old infections will often yield more rapidly to this open treatment. A cage can be made from wire screening, the edges of the cage being bound with adhesive. This can then be sterilized with heat and applied over the wound. A thin gauze covering is placed over the wire cage, and adhesive strips are used to hold the entire dressing in place. Free access of air and sunlight seem to hasten the healing process.

Protective devices are often necessary, especially where employees return to work after the dressings are applied. These consist of wood splints, tin splints, wire cages and other such measures. They are usually retained in place by the use of adhesive plaster.

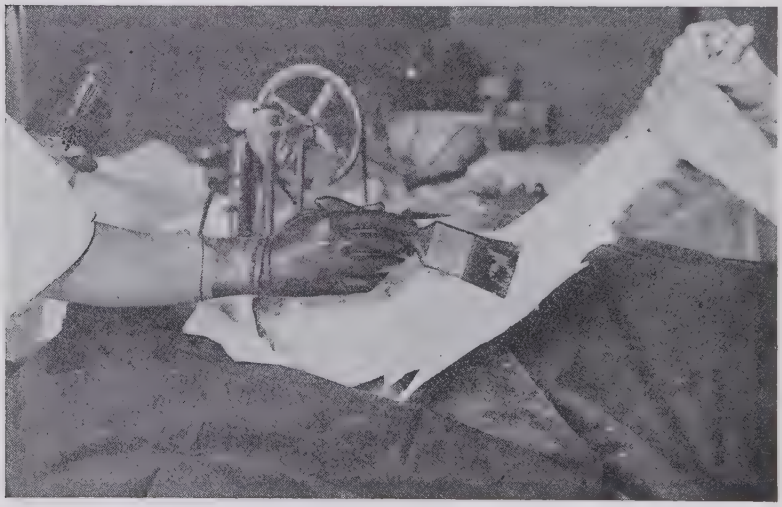

FIG. 85.—Paraffin treatment of burns: *e*, painting paraffin over the cotton. (Figs. 72 to 76 from clinic of *Dr. Corwin, Colorado Fuel & Iron Co.*)

CONCLUSION

The following points are so vital in emergency surgical work that their repetition is justified:

1. Always sterilize open wounds no matter how slight or how extensive and no matter where located. Tincture of iodin is the best antiseptic to use.

2. The surgeon must begin his emergency treatment *immediately* after the accident occurs.

3. The same asepsis must be observed as in operative surgery. Only sterile dressings must be applied to the wound.

4. Immediate immobilization of the injured member whenever indicated.

5. Shock and hemorrhage, whenever present, must receive first consideration.

6. Keen judgment, carefulness and alertness, adeptness and ingenuity, and a constant enthusiasm are the necessary attributes of a good emergency surgeon.

CHAPTER XXXIV

THE SUBSEQUENT OR PERMANENT TREATMENT OF CERTAIN INJURIES

In previous chapters on industrial surgery, consideration has been given to preventive surgery, to first aid care, and to the immediate or emergency treatment of injuries the result of accidents. The remaining function of the physician practicing industrial surgery is to render subsequent or permanent treatment to the injured employees. These four functions are so closely interrelated that to be a successful industrial surgeon one must be expert in all of these four lines. Some of the best surgeons of the country are capable of doing excellent repair work in accident surgery but would make poor industrial surgeons because they are not trained to think of their surgical results in terms of the man's work. Both preventive and emergency surgery are based upon the economic end-results. The subsequent surgery and the permanent treatment involve the same economic considerations—the quickest possible recovery, the restoration to full function or as nearly so as is possible when the nature of the injury is considered, and the placement at suitable work compatible with the function attained.

The best emergency surgery is rendered in those industries where a surgeon is on the job to give immediate treatment to every accident case. The majority of injured employees are able to report to the plant dispensary for their subsequent treatment or in the absence of such a dispensary, to the surgeon's office. The success of these ambulatory cases depends upon frequent dressings, careful supervision to see that the dressings are not removed and proper assignment of the injured to such work as will not delay the healing process. Work is one of the best therapeutic adjuncts which the surgeon can employ and in every case he should get the employee back to some occupation in the industry as soon as possible.

In a certain number of accident cases, the injuries will be so serious as to confine the employee to his home or to the hospital and arrangements must be made to carry on the permanent treatment in one or the other of these places. When subsequent operations are necessary the patient should always be sent direct to the hospital. As a general rule closer supervision can be maintained and better results obtained by rendering the permanent treatment of these serious injuries in the hospital rather than in the home. Much of the success

of the industrial surgeon will depend upon his powers of persuading patients to accept this hospital care. The majority of dissatisfied patients belong to those receiving home treatment and these are the ones who usually enter damage suits in the courts or claim excessive compensation.

A few of our largest industries have their own hospitals adjacent to the plant where both the emergency and permanent treatment can be carried on. Two industries have a ward in connection with its doctor's office where the serious cases can be kept for twenty-four or forty-eight hours and then removed to one of the outside hospitals in the community. In these concerns, the surgeons do most of the operative work at the plant, even operating hernia cases, and then placing them in the ward for twenty-four hours. At the end of that time they are taken in an ambulance to one of the city hospitals. This plan saves a certain amount of expense to the management but is rather a dangerous procedure from the standpoint of the safety of the patient.

As a general rule major operative work requiring an anesthetic should not be performed in the plant dispensary. Such work requires considerable time and ties up both the staff and the doctor's office so that the other medical and surgical functions are neglected. Again it sometimes happens that a patient dies during the anesthetic. There may be many excellent reasons for this death but the working force always blames it on the anesthetic. The morale of the employees is lowered and their confidence in the doctor's office is shaken by the depressing news of a death occurring there. Years ago in one industrial dispensary the surgeon attempted to remove some diseased tonsils from one of the employees. A light anesthetic was given and before the operation commenced the patient suddenly died. The news of this death spread rapidly throughout the plant. Following this accident it was almost impossible to persuade injured employees to report to this dispensary for treatment. I am told that a drastic rule was immediately made by the management that no anesthetic should ever be administered in the plant. In the author's experience it has only been necessary once to give a general anesthetic at the plant dispensary. A patient needing operative work requiring an anesthetic can usually be transferred to a hospital where every facility is at hand to meet any emergency that may arise. By careful emergency surgery and rapid evacuation of serious cases to an outside hospital, we have been able to avoid death in the dispensary for the last ten years and as a result the confidence of the working force in the doctor's office has never been shaken. Neither did any one of these patients die as a result of being moved.

It is very essential that the best and most up-to-date hospital

in the community should be chosen for the care of injured employees. The surgeon should endeavor to have certain wards and private rooms set aside in this hospital for his cases and he should become a recognized member of the staff. Only in this way can he obtain the best nursing and interne service for his patients, both of which are absolute essentials in accident surgery. These serious cases should not be turned over to a disinterested surgeon, for employees are much better satisfied if they are in the hands of a qualified surgeon directly responsible to the management of their industry. Such a one becomes a connecting link between the employer and employee and in a hundred little ways is able to convey the personal interest of the former to his injured workmen.

To be successful the permanent treatment of these seriously injured employees must include: first, the actual surgical treatment and subsequent dressings; and second, the psychotherapeutic treatment.

It is not the intention of the author to write a treatise on the surgical treatment of specific injuries following accidents, but rather to deal with certain general principles involved in industrial surgery. Many standard surgical works and such books as Foote's "Emergency Surgery," Moorhead's "Traumatic Surgery," Cotton's book on "Fractures and Dislocations," and other of the more recent writings on war surgery, will give the student the necessary information on special lines of treatment.

The psychotherapeutic treatment of the injured, however, has been woefully neglected by the majority of surgeons, and consideration of this important phase of the care of injured employees is indicated.

The psychology of a workman who has received injuries the result of his employment, is peculiar and has an important bearing on the successful outcome of the treatment. In the first place, he feels that his employer is responsible for his suffering and disability and should be made to pay dearly for the same. He is then forced to accept the administrations of a surgeon chosen by this employer rather than by himself or his family. He is carried directly to a hospital and if conscious, usually frets a great deal over how the news of his accident will be broken to his wife or family. His surroundings are strange, the experience is entirely new and he is in the hands of strangers. An immediate operation may be necessary and how does he know whether the doctor will amputate the injured member or otherwise leave him permanently disabled. In case of such permanent disability, how will he ever make a living again and what will become of his family? These and a thousand other fears prey on his mind and unless immediately dispersed by the surgeon may interfere with his recovery.

During the days and weeks which follow, such a patient can easily become discouraged or dissatisfied and as a result he develops a neuro-

sis which usually greatly delays his recovery. If his daily dressings are extremely painful, another factor for the development of neurosis is introduced. Or if pain and discomfort accompany the use of an injured member he may resist all efforts to regain function in the part and delay of this kind frequently results in permanent disability. During these days while lying in bed slowly recovering, his mind will have time to dwell upon the thoughts of compensation. The desire for excessive compensation may become so great as to cause him to feign certain conditions, while in other cases he may resist all efforts for a rapid recovery in order to receive his weekly compensation over a longer period. This latter is often the case when, in addition to his accident compensation, he is receiving benefits from his lodge or union.

All of these various mental states play such an important part in the recovery of these injured employees that the industrial surgeon must constantly be on the alert to counteract their influence. With this in mind, let us consider the various methods necessary to meet these conditions.

Better results can be obtained if the surgeon employed by an industry, providing he is capable, takes complete charge of every accident case. In the majority of instances when employees choose their own doctor, their period of disability is prolonged and the functional results are not uniformly good. On the other hand, if the employer arbitrarily chooses the surgeon for his employees, he should pick one whom he, himself, would trust in every emergency. The reputation of such a surgeon soon spreads throughout the working force so that when an employee sustains a serious injury, his confidence in the doctor is already established. The surgeon, however, must endeavor to gain the complete confidence of every injured workman from the very minute he takes charge of the case.

Establishing confidence, therefore, is the first link in the psychotherapeutic care. If the surgeon enters the dressing room without paying much attention to the patient, becomes excited at the sight of the wound, and cries out orders and counterorders to his assistants, starts one line of treatment then switches to another, handles the injured member roughly or otherwise causes unnecessary pain, he soon has the patient and all those about him completely bewildered. On the other hand, if the surgeon takes time to speak to his patient while sizing up the extent of his injury, learns the patient's first name and addresses him by it, cheers him up and endeavors to overcome any antagonism which may exist, then gently but deftly renders the necessary treatment, quietly issuing his orders to his assistants, he immediately establishes an atmosphere of calmness and efficiency which impresses and reassures the injured. Such a surgeon is not only the mechanic called in to repair the broken parts but at once becomes a

friend and that confidence between doctor and patient, so necessary in accident surgery, is established.

Reassuring the patient that his wounds are not as serious as he may think must be stated as soon as the surgeon has had the opportunity of inspecting the condition. The more serious the wound the more essential it is for the surgeon to smile and not betray by the least sign his fears of a fatal outcome. Such remarks as "internal injuries," "high amputations," "gangrene," and other equally terrifying terms should not be made in the presence of the injured. If the friends or relatives excite the patient they should be kept from the room. While combating death with your every effort, if the patient is conscious, cheerfully reassure him and stimulate him to put up a fight.

Notifying the relatives about the accident must be thought of at once. No employee should be taken to the hospital without immediately sending someone to notify his family. No worse seeds of dissatisfaction can be sown than to leave the wife worrying all night over the non-appearance of her husband after his day's work, or even allowing several hours to elapse before notifying her. The author trained two of his nurses in the best and most tactful way of approaching the family and telling them of the injury. These nurses were given the authority to call a taxicab whenever necessary and bring the wife or other members of the family to the hospital as soon as possible. By the time the wife has reached the hospital such a nurse usually has her trained to approach the husband without unduly exciting him. Surgeons who neglect the family miss their greatest opportunity of establishing friendly relations with the patient.

Explaining the whys and wherefores of every step in the treatment of his case is the best means of securing the co-operation of the patient. If a part must be amputated explain the reasons to the patient and show him the futility of endeavoring to save the member. On the other hand, if there is a possibility of saving the part and yet later it may become necessary to amputate, explain the condition and get him interested in the fight. If it becomes necessary to amputate two weeks later, he will fully understand the delay and will not criticise you for neglecting to operate at once.

Avoid unnecessary pain during the daily dressings. When severe pain is inevitable the surgeon should employ nitrous oxid gas during the dressing. This anesthetic can be administered similar to the use of gas in an obstetrical case. Such details hasten the recovery and win the everlasting gratitude of the patient.

Study the mental attitude of the patient and strive to overcome all those stimuli for the development of traumatic neuroses. If the man is fussy and given to complaining it may be necessary to coddle him. Again, such a patient may best be treated by the surgeon taking

a firm stand and scolding him; and in still others, this mental state may be overcome by carefully explaining its effect on the final recovery. Every injured employee has his moods and each must be handled individually.

Mental idleness is the greatest drawback to a quick recovery. The patient who lies all day with nothing to do has time to worry and become dissatisfied. Therefore, the surgeon must counteract in every case this mental idleness. Bedside and ward occupations are the best means of accomplishing this. In the past, nurses have realized that their patients are better satisfied and require less personal attention if they are employed, and so have given them light duties to perform,

Fig. 86.—Incline in the Minnequa hospital. (Grade 1 foot in 6.) Serviceable for the sick and lame. Can also be used for giving graduated exercises to heart cases and other convalescents. (*Colorado Fuel & Iron Co.*)

such as rolling bandages, preparing dressings, making applicators and other light or useful employment. The busy surgeons have neglected this form of psychotherapy. The author has been in the habit of learning the exact occupation of each of his patients and then tactfully stimulating him to study and work along lines which will improve his status on returning to his job. I have found many of these patients greatly interested in improving their education during the long days of convalescence. Some who have not had the opportunity of going to school will welcome the chance of studying the three R's. Others will enter into the study of chemistry or of stenography, bookkeeping, commercial lines and similar studies, and will develop ambitions during these days of convalescence which they never dreamed of before.

Still other patients will respond more readily to manual diversions. They will spend hours working over puzzles or at basketry or at weaving, or even playing games with some fellow patient. In many instances I have found problems connected with their occupation in the plant, have brought these problems to them and have suggested that they might improve their standing as an employee by working out some improved method during these days of idleness. Many of these employees will take a draughting board, drawing paper and pencil, and with rulers and compasses will study out many ingenious, often impractical, contrivances. The chief point is that they have become interested in their work and are anxious to return to the job in order

Fig. 87.—Amputation case learning typewriting during his stay in the hospital. Appliance on typewriter enables making of duplicate copies.

to try out some of these experiments. When an employee has lost an arm or a leg or even an eye as a result of his accident, he is greatly discouraged and feels that his future is damned. A good surgeon will immediately conceive methods of awakening ambition in such patients. If they cannot return to their old job he will suggest lines of study or work which will prepare them for a better position in some allied occupation. The employer can often be interested in these efforts and will be of the greatest help in suggesting the means of preparing the patient for his future.

This rehabilitation of injured employees is one of the most fertile fields of endeavor open to the surgeon. Every hospital should provide

some qualified person who can assist in these forms of psychotherapy. Often the manual work which is given the patient will be such as will help him to regain function in an injured member. For instance, contractures following a hand infection often result in stiff and useless fingers. Early employment of the fingers by typewriting, by weaving, by grasping a hammer or a saw, and similar methods will be of the greatest aid in preventing undue contraction and restoring function.

OCCUPATIONAL THERAPY

This use of work as a means to help restore function and as an adjunct to the usual surgical treatment, employed as a form of psycho-

Fig. 88.—An amputation case learning to use his stump by doing wood-carving.

therapy, is called occupational therapy. It can be used during the hospital treatment or the home treatment as above described. Small shops should be established in connection with each hospital where various kinds of occupational therapy can be administered.

As soon as possible, however, patients should be removed from the influence of the hospital. Every surgeon knows the great patience and time that is often required to overcome the hospitalization which follows a prolonged sojourn there. But patients leaving the hospital and allowed to remain in idleness around the home frequently develop even a worse state of mind. Therefore, as soon as possible after

leaving the hospital every injured employee should be returned to some light occupation in the plant. Foremen must realize that this is a definite part of the treatment and that such employees are not expected to turn out an average day's work.

To successfully carry on such occupational therapy, industries would find it greatly to their advantage to establish schools and experimental shops in some portion of the plant where every injured man, or woman, could spend the days of convalescence in some form of occupation. This would not only hasten recovery but would make a better employee when he returns to work. Every efficient management is anxious to fill the better positions in the plant, such as foremen, chief clerks, etc., from the ranks of its working force. Many foremen and future managers could be developed in these schools and shops maintained for injured employees.

The following example illustrates to what extent light occupations about the plant can be employed by the surgeon to assist in restoring function to disabled parts.

C. W., forty, male, Polish nationality, was severely burned about his right arm, right leg and back. After three months the wounds had healed but wound contractures were threatening to cause permanent deformities. During his stay in the hospital this patient was given passive motion and as soon as possible active motion, and certain work and exercises to prevent these contractures. In spite of these precautions the right knee had considerably flexed and the right wrist was greatly restricted in motion. During this period of his disability, C. W. had received his full weekly wage from the concern. Arrangements were now made for his return to light work as we recognized that he was neglecting to exercise these parts while remaining at home. The patient objected to returning, however, and so it was explained to him that from that time on he would only receive two-thirds of his wages which was the amount required by the compensation law. On the other hand, if he would return to light work for a few hours every day at first, he would continue to receive his full wages. This argument as usual prevailed and C. W. reported for duty. He was given a light paint brush and a bucket of paint and assigned the task of painting the steam pipes and radiators. In order to do this, it was necessary for him to ascend four steps on a ladder while painting the overhead pipes, then he stood on the floor for a portion of the time and in order to paint the pipes near the floor he was forced to stoop and bend the knee. At first he persisted in using his left hand in wielding the paint brush but the surgeon got him interested in the game and bound up the left hand so that it was impossible to hold the brush. Naturally he was very awkward during the early days and accomplished very little work but gradually he began to

use the wrist and knee more and more. After one month the knee was perfectly straight and could be flexed or extended at will. It took three months to restore perfect function in the wrist but at the end of that time C. W. was an expert painter and the management decided to keep him permanently on this job. His wages were increased commensurate with this work, whereas before the accident he had been a day laborer about the power plant earning some $16.00 a week. He had now learned a trade and for the first time in his life had developed an ambition. When at the end of three months he received his first weekly pay check for $22.00, C. W.'s Americanization was completed and he began at once planning to buy his own home. Two years later this employee told the surgeon that his accident was the best thing that had ever happened to him.

PHYSIOTHERAPY

Massage, Hydrotherapy, Electrotherapy

Industrial surgeons as well as all others have devoted almost their entire attention to standardize surgical methods and have neglected many of the therapeutic adjuncts which are of the greatest assistance in restoring function and securing rapid recoveries. The idea of bedside occupations and later the application of occupational therapy as described above has developed during the last few years and has lately been especially stimulated by the reconstruction of disabled soldiers in the European and Canadian hospitals and now in our own hospitals. The use of massage, electricity and the various forms of hydrotherapy as definite therapeutic methods have been known for years but these excellent means have been left chiefly to a few enthusiasts in the profession or have been relegated to the realms of quackdom. Many a surgeon has been chagrined by having a patient over whom he has labored for months, seek relief at the hands of some osteopath or other type of physiotherapist, and return to him completely cured in the course of a month. The reason for this is that the surgeon has depended entirely on the old classical lines of treatment taught him in medical school and failed to take advantage of some of these most excellent methods used by the other man. Instead of condemning these therapeutic measures because they are used chiefly by the so-called quack, we should condemn those practitioners who claim a cure-all by these means. The whole field of physiotherapy has played such an important part in the surgical work during this great war that these methods will undoubtedly become a definite part of the therapy practiced by surgeons in the future.

Major R. Tait McKenzie, M. D., professor of physical training at the University of Pennsylvania, has covered this field very

thoroughly in a book entitled "Reclaiming the Maimed." Every industrial surgeon should become familiar with the methods therein described. Under many different conditions he points out the great value of massage, hydrotherapy and electrotherapy as a definite part of the permanent treatment.

For instance, in the case of injuries to peripheral nerves, all the way from bruising of a nerve trunk to its destruction and restoration by surgical means, he states: "These cases are accompanied by weakness, or paralysis, muscular wasting, and contractures. They are treated by wet or dry heat to exalt the local circulation; supported in proper position by splints to prevent the overstretching of weakened muscles, and the resultant permanent contraction of those that are unimpaired; galvanic, and afterward faradic, stimulation to the affected muscles; massage to keep up or improve their nutrition; passive movement to prevent contraction and limitation of the normal range of the joint; progressive active movement, joint by joint, to bring back and strengthen voluntary power; ending with gymnastic and occupational therapy for skill to fit the patient to take his place in civil life again."

In regard to scar tissue with contractures and in extensive scar tissue following old septic wounds, McKenzie says: "Such wounds are treated by the warmth of the whirlpool bath, which in twenty minutes changes the cold purple of the painful hand into a warm crimson, and enables the masseur to stroke, knead, and move a joint in a way that no amount of persuasion would have made tolerable without it.

"The hastening of repair in these scars by diathermy and ionization and the stretching of beginning contractures by careful manipulation, taking care to avoid the breaking down of scar tissue in course of organization, are among the triumphs of these methods."

This war has greatly increased our knowledge of functional neuroses and many a surgeon, as a result of his war experience, has developed the necessary patience to successfully handle these cases. These neuroses take the form of paralysis, contractures, areas of anesthesia or hyperesthesia, loss of sight, speech or hearing and many other peculiar phenomena. Many miraculous cures have already been accomplished by our physiotherapists working in the war hospitals. In these cases massage, hydrotherapy and electro-therapy combined with the personality of the operator furnish a combination of hypnotism, suggestion and encouragement and results in the cure of many conditions which would not otherwise yield to the ordinary treatment. Unfortunately thousands of soldiers will be thrown back into civil life who have been cured by this form of physiotherapy and they will more than ever before depend on these methods as cure-alls for every condition. "Quacks" will take advantage of this

to extend their profiteering on the human credulity. In order to prevent this, surgeons must standardize these methods and apply them in every case where they can hasten or assist recovery.

Several industrial surgical dispensaries have already adopted these methods. A qualified masseur is employed on the medical staff to give massage under the direction of the surgeon. Arm baths and leg baths have been added to the equipment of the dispensary where hot and cold hydrotherapy can be administered when necessary. McKenzie advocates the whirlpool bath in all cases of painful stumps, painful scar tissues, partial paralysis, injuries to nerves and to any condition which lowers the circulation and nutrition of the part.

"The arm or leg is thrust into a vessel containing water at a temperature varying from 105 up to 115 degrees. This water is

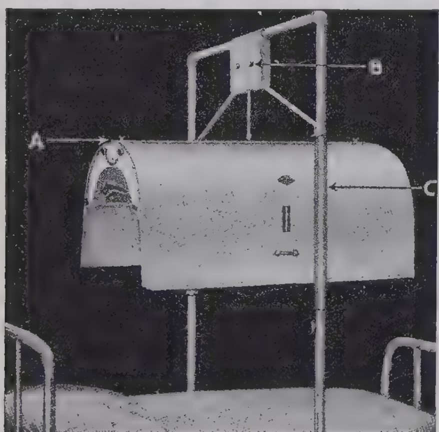

FIG. 89.—Adjustable electric cabinets suitable for local heat bath. (*Burdick.*)

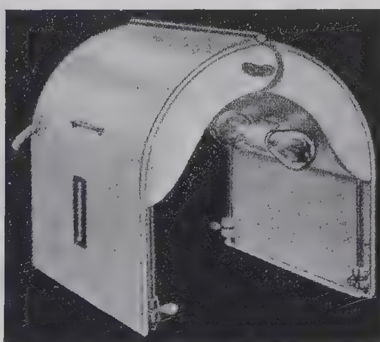

FIG. 90.—Same as Fig. 89.

circulated by means of jets set at an angle or by a propeller. Air is also introduced, so that the limb is immersed in a swirling, bubbling current. In this way the part is flushed with blood, and the full effect of heat is obtained in a way that is impossible if the water is still."

The author has recently used radiant light and heat in the treatment of strains, backaches, muscle pains and other conditions of obscure origin but undoubtedly having a neurotic basis. Such cases report to the doctor's office frequently and continue to report for days and weeks complaining of the pain which does not yield to the ordinary methods. If such patients receive proper attention the first day they report and are put in the rest room and given a course of treatment with the radiant heat followed by massage, the condition is usually cured at once, or within two or three treatments, thus saving these cases much loss of time from work and the accompanying inefficiency which goes with such conditions. Figures 89 and 90

illustrate two types of local light and heat baths which can be used in the surgical dispensary.

Dr. B. F. Lounsbury in his railroad accident surgery at the Washington Boulevard Hospital, Chicago, keeps a physiotherapist in constant attendance at the hospital. In practically all major accident cases he employs faradic and galvanic electricity, heat and light baths, hydrotherapy, massage and gymnastic exercises as a definite means of restoring function and hastening recovery. All these methods can be applied in the large industrial dispensary and the results obtained justify the additional expense.

FUNCTIONAL RE-EDUCATION

Functional re-education aims at the restoration of lost or restricted function in a disabled member. It is based upon the principle of

Fig. 91.—A hospital bed with frame and sling attached. This enables patient to move himself and facilitates exercising in bed.

letting each patient be his own doctor. During the early days of convalescence an operator must give the massage and passive move-

ments necessary to prevent complete loss of function, but as soon as possible active movements by free exercise or with apparatus should be instituted in order that the patient himself can re-educate the part and cultivate strength and endurance. This re-education can be made so interesting for the patient that it takes his mind off of the disability and, therefore, has an excellent psychotherapeutic value.

While a limb is still in a splint, or otherwise immobilized, a patient may learn certain muscle resisting exercises by a process of mental control over different groups of muscles. In this way muscle twitching without moving the joint can be commenced weeks before the splint is removed. When final and free motion of the joint can begin, the muscles having become strong instead of atrophied, the patient

Fig. 92.—A bed table suitable for games or bed-side occupations. (*Courtesy of Dr. Corwin.*)

is able to raise the dropped wrist or to bend the stiffened knee. The period of disability can be greatly reduced by this type of functional re-education.

The greatest value of functional re-education, however, is found in those cases of scar contracture, stiff joints following long splintage or following extensive injuries with scar formation, in paralysis following injuries of the nerves or in those cases of lost tendon and muscle tissue. The value of occupational therapy as a form of functional reëducation has already been pointed out and wherever it can be applied in a practical way it is certainly of more value than any other form. However, during the hospital days and the convalescent period before the patient is able to take up practical work this reëducation can be greatly facilitated by the use of certain appliances.

MECHANOTHERAPY

The use of apparatus for functional re-education is called *mechanotherapy.* Its principles are best described by Dr. McKenzie who has invented several different types of apparatus which are now in use in practically all the Canadian war hospitals and several of the army hospitals in this country.

"Apparatus is necessary to bridge the gap between free movement and the more complicated and skillful co-ordination of gymnastics and occupation, and it can be constructed so as to give a graduated and measurable load, to be increased as strength returns. Muscles work better against resistance than free, and the necessary resistance may be given by the hand, by friction, forming a brake on the turning of a wheel or handle, by stretching elastic cords, or by stretching or compressing springs. In these devices, it is difficult or impossible, to measure accurately the work done. They vary at different stages of the movement, are uneven, and the patient quickly tires and becomes discouraged, because he cannot see a definite and measurable improvement. The best principle to use is the raising of graduated weights, either by a lever or by a rope and pulley. In the former, the weight is clamped on a lever at points indicated on a scale, the lengthening of the lever increasing the force necessary to raise it. This is the principle employed by Zander in most of his machines, which, however, are expensive, complicated, cumbrous, require much space, and need an engine to supply motive power for some of them. Appliances can be constructed to produce accurately the same effects at one-tenth the cost, by making use of the weight and pulley.

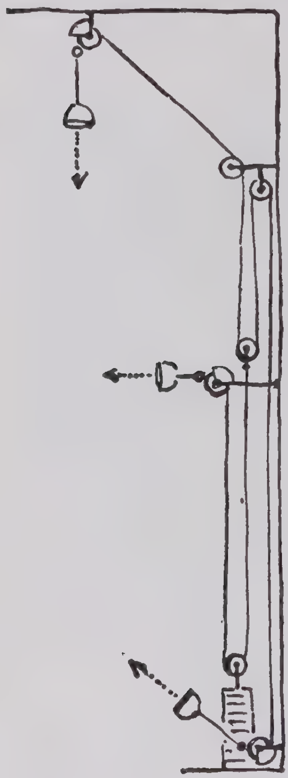

FIG. 93.—The triplicate pulley weight. (*McKenzie,* "*Reclaiming the Maimed.*" The Macmillan Co., Publishers.)

"Figure 93 shows diagrammatically an arrangement by which the direction of the resistance may be upward, downward, or from the side. Machines combining these three movements are called triplex, or triplicate machines, but, in addition to these, special devices are necessary for exercising certain joints. The following set of appli-

ances are designed to combine simplicity, cheapness, and efficiency. They can be easily multiplied to any extent by a good carpenter and blacksmith who has the pattern before him.

"Their use should have a place in a definite sequence; treatment begins with the preparation of the limb or joint by electricity, radiant heat, or hot baths, then massage and passive movements, as already described, followed by active movement. A mirror is of great value

Fig. 94.—Protractors for measuring angles of movement in the shoulder, elbows, wrist, knee and ankle. Hart House. (*McKenzie, "Reclaiming the Maimed."*) The Macmillan Co., Publishers.

to teach accuracy and associate the feeling of the movement with its appearance.

"Before beginning the re-education of a joint, the range of movement should be carefully measured. This is done by means of protractors of cardboard, or galvanized sheet iron, with the scale marked in degrees. The illustration shows the method of measuring movements of the shoulder forward and backward, the protractor being set with zero perpendicular to the joint as checked by a plumb line. The movement in either direction is marked in degrees. The elbow, wrist, knee, and ankle are measured by the second protractor made

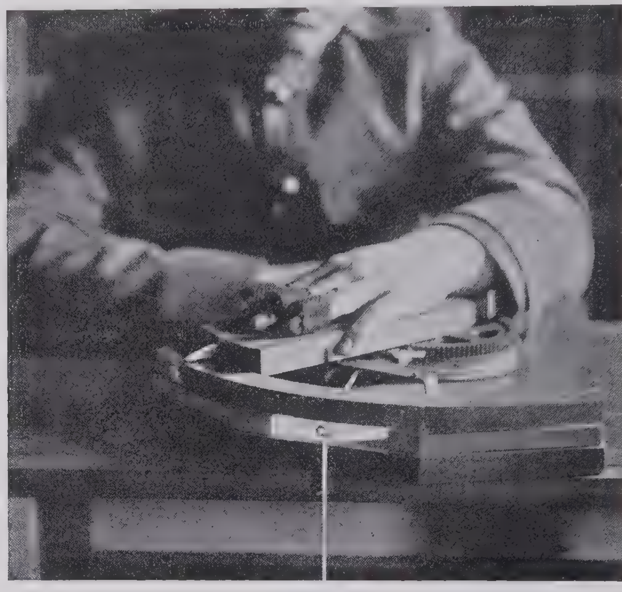

Fig. 95.—Adduction and abduction of wrist. Note the scale to measure the angle of movement. (*From McKenzie, "Reclaiming the Maimed."*)

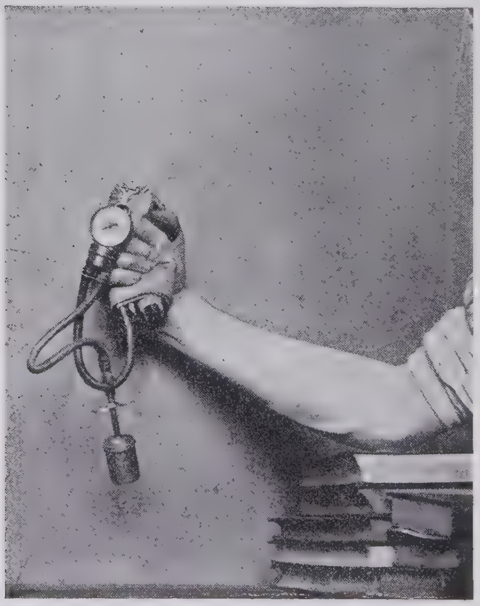

Fig. 96.—Measuring strength of grip by the tycos sphygmomanometer. F. W. Harvey. (*From McKenzie, "Reclaiming the Maimed."*)

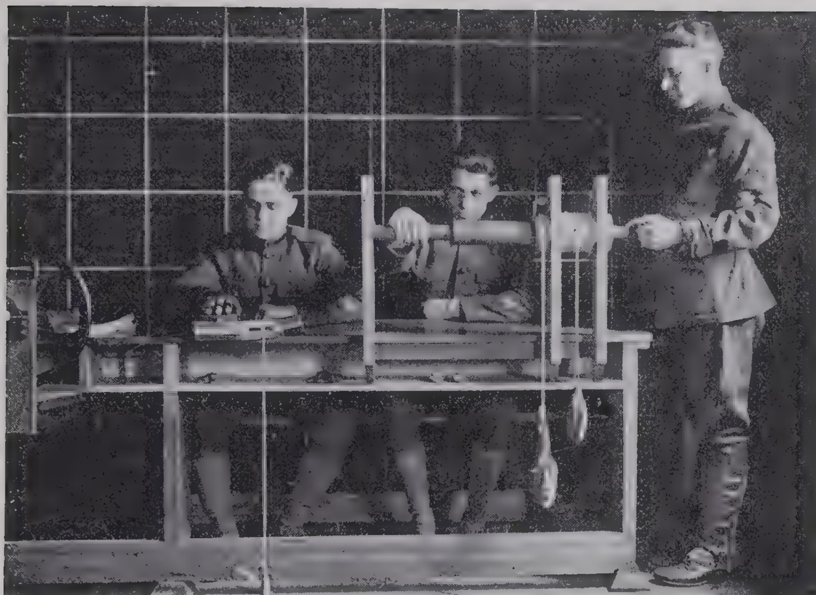

Fig. 97.—Wrist abduction in action. *E*, beginning of wrist extension. *F*, correct position of arm in pronation. (*From McKenzie, "Reclaiming the Maimed."*)

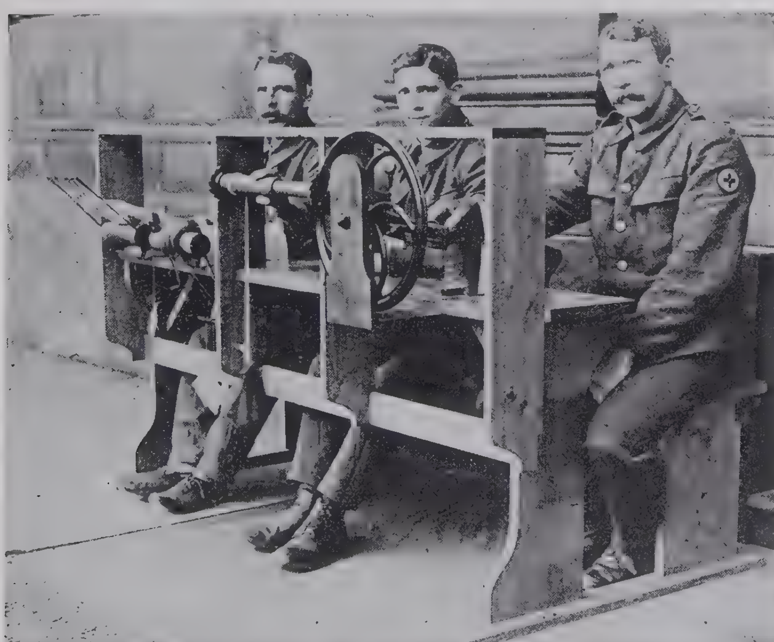

Fig. 98.—Rotation, flexion and extension and lateral movements of the wrist. (*From McKenzie, "Reclaiming the Maimed."*)

of galvanized iron strips, hinged, and with a scale pasted on to a side plate.

"Most of the appliances about to be described have protractors attached, so that the range of movement can be watched by the patient

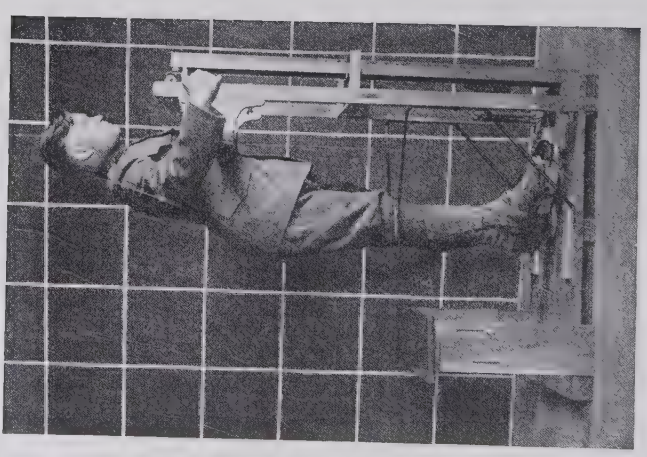

Fig. 99.—Rotation of hip—the knee extended and the pelvis fixed. *(From McKenzie, "Reclaiming the Maimed.")*

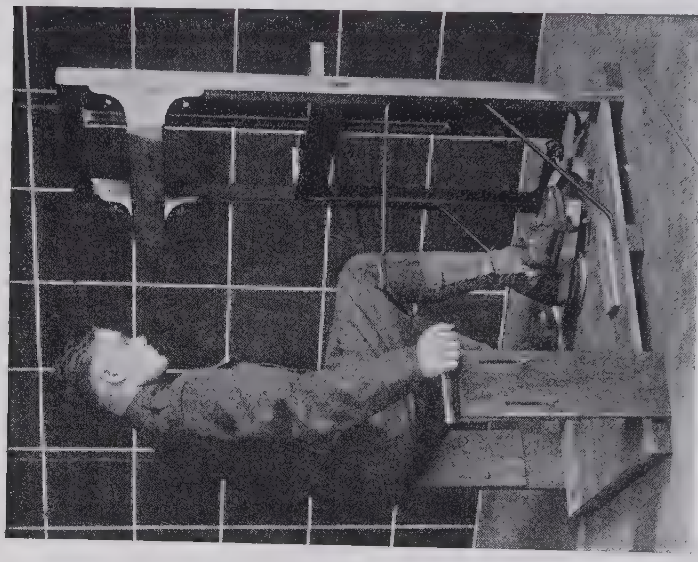

Fig. 100.—Rotation of the knee, abduction of the foot. Note the scale and pointer in front of the foot for the measuring of the movement. *(From McKenzie, "Reclaiming the Maimed.")*

himself, during the exercise, and this additional incentive given him to use his best efforts. The measurement of ability to repeat movement will be in terms of weight raised and number of repetitions. The maximum strength of the grip can be taken conveniently by partly inflating the cuff of a Tycos sphygmomanometer and noting the height to

which the mercury is raised when the cuff is squeezed. This is quite as reliable as Amar's bulb, and is better than the ordinary hand dynamometer.

"The appliances are for two purposes, stretching and improving the strength. All the stretching movements are kept within the vol-

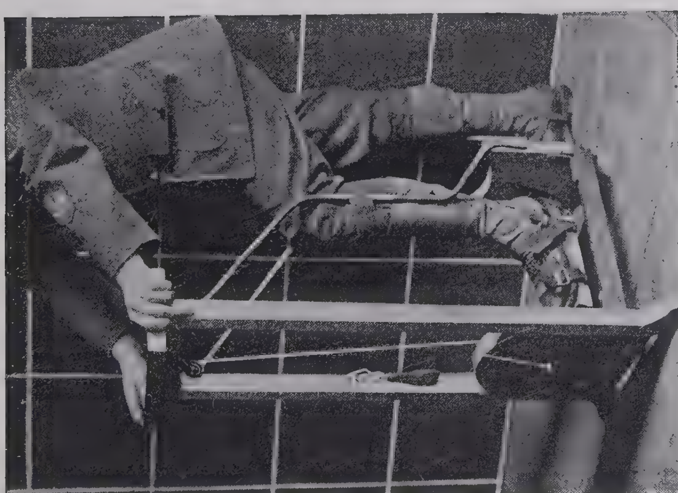

Fig. 101.—Eversion and inversion of ankle. Note the fixation of the leg, also the scale and pointer marking the angle of movement. *(From McKenzie "Reclaiming the Maimed.")*

Fig. 102.—Exercise for foot drop. Note scale and pointer to record angle of movements on left side, and fixation of leg near the knee. *(From McKenzie, "Reclaiming the Maimed.")*

untary control of the patient, who can be trusted to desist before danger of lacerating firm adhesions is imminent. The appliances for improving the strength can be loaded with increasing weights as the power to lift them returns and the patient can be interested in watching the extent of each movement, as shown on the scale, in watching the rising weight as it is lifted, in calculating the total amount

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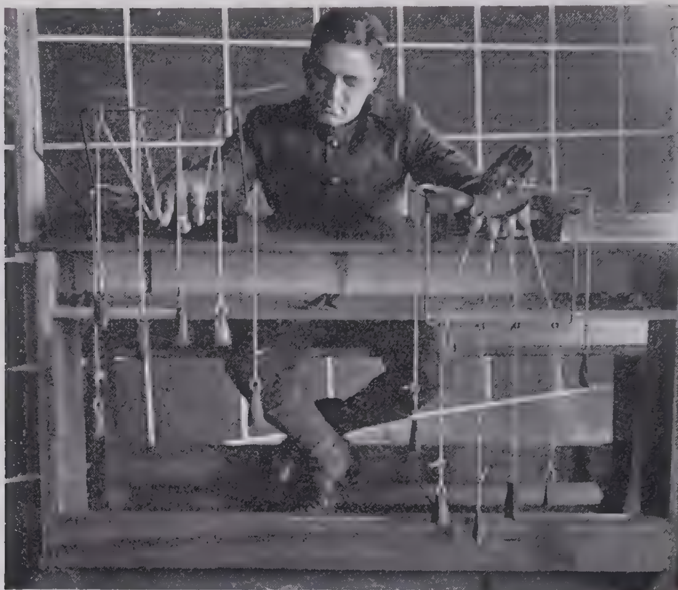

Fig. 103.—Pulley weights for exercising fingers in flexion and extension, right hand doing exercise 1, left hand with thumb attachment doing abduction. (*From McKenzie, "Reclaiming the Maimed."*)

Fig. 104.—Crumpling up a newspaper as an exercise for the hand. (*From McKenzie, "Reclaiming the Maimed."*)

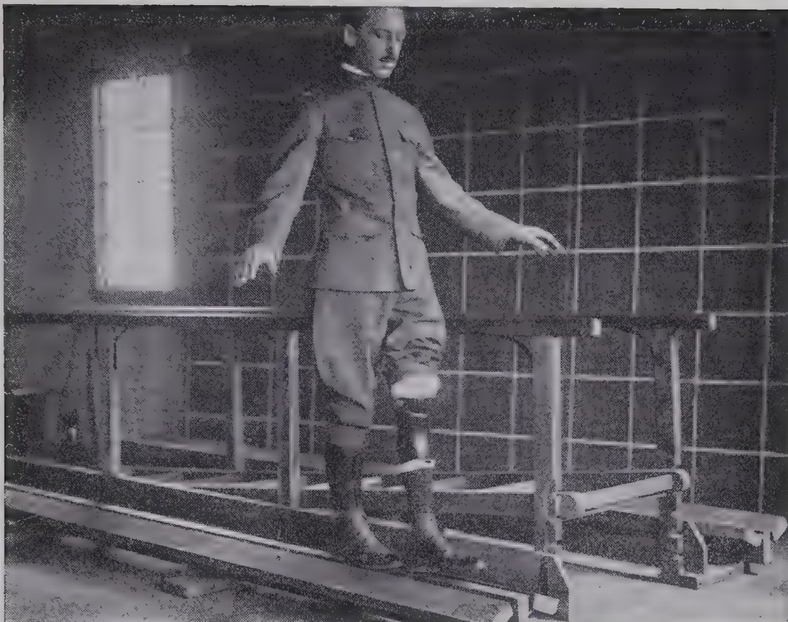

FIG. 105.—Amputated case learning control on the balance beam. (*From McKenzie, "Reclaiming the Maimed."*)

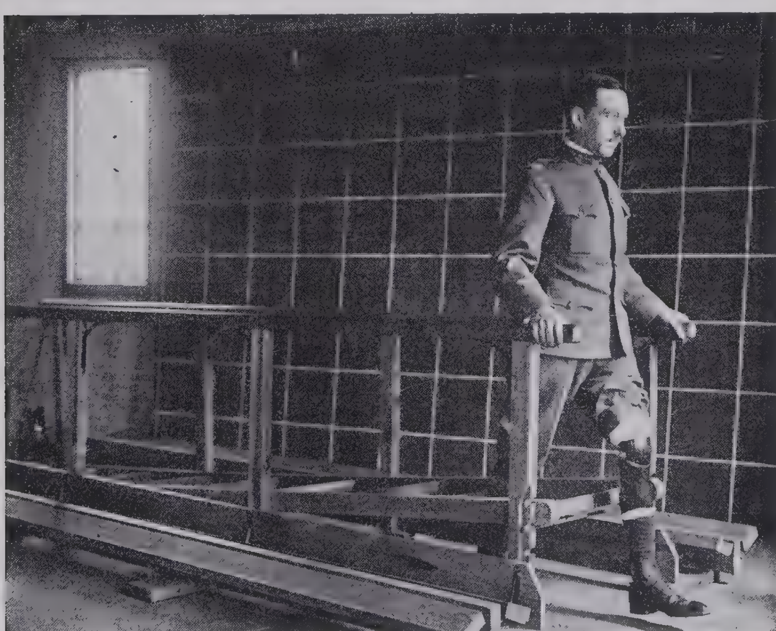

FIG. 106.—Amputated case practicing walking through the ladder to exercise the stump and teach control. Inversion and eversion treads also shown. (*From McKenzie, "Reclaiming the Maimed."*)

of work done in foot pounds, or in listening to and counting the clicks of the ratchet as the movement is made."

The author refers the reader to McKenzie's book, "Reclaiming the Maimed" for a complete description of these various forms of mechanotherapy. Figures 97 to 107 show the varied exercises which can be obtained by the McKenzie apparatus.

The chief point about mechanotherapy is that the patient is his own doctor and after his interest in the game is once aroused, he can usually be depended upon to exert every effort to overcome the lost function. In many cases of ankylosed joints following recent injuries, motion can be restored by daily persistent exercising over a period of a few weeks. In contradistinction to this method consider

Fig. 107.—A hammer handle made to fit a deformed hand. It is first surrounded with dental wax softened in hot water, then patient grasps it as tightly as possible making an impression of the deformed hand. Wax is then hardened by dipping in cold water. Patient now has a handle shaped to his hand. As flexion develops in fingers new impressions are made. (*Allen.*)

the great damage which has often been done by surgeons forcibly breaking up one of these ankylosed joints. The tissues are practically always lacerated and the ligaments may be torn away from their attachments. The adhesions which form during the healing process following this operation often cause a worse ankylosis. Patience is the first lesson which the industrial surgeon must learn.

GYMNASTICS AND GAMES

A long sojourn in the hospital develops hospitalization which is characterized by sluggishness of mind and body. The patient's physical, mental and moral stamina is greatly lowered and demands

treatment just as much as the injured part demanded surgical care. The neglect of this state of hospitalization has resulted in prolonged disability and in many unjust claims for compensation on the part of the patient.

Gymnastics, special setting-up exercises and outdoor games have been found of the greatest value in overcoming the damage done by the enforced idleness of hospital life. These methods have especially been

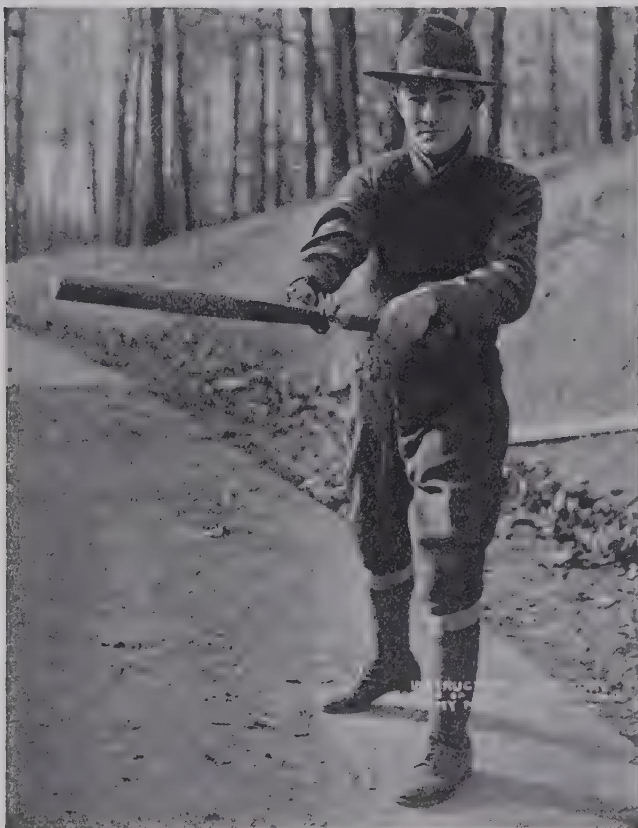

Fig. 108.—An amputated case learning to use his artificial appliance by playing ball.

employed among the soldiers convalescing from their war injuries. In development battalions in this country many an injured soldier, or one disabled by disease, has been restored to full duty by special exercises, drills and games carried on under the supervision of the medical officer. Before the establishment of development battalions, this same class of patients was discharged from the army as unfit, and to-day, constitute a large group of the discharged disabled soldiers drawing compensation.

Special gymnastic exercises can be given to many of the bed

patients with very beneficial results. By gradually increasing these, they can leave their beds with strong muscles and generally increased

Fig. 109.—Soldier patients at Walter Reed Hospital cutting short the time of convalescence by graduated physical exercise. (*Bryant.*)

Fig. 110.—Same as Fig. 100. Arrangements should be made for the physical development of all convalescents in our civil hospitals.

strength instead of the weakened, emaciated condition which cause so many to faint when they first try to get out of bed. Graded exercises

can be given in the hospital wards to all the patients who are able to stand up. This should be one of the functions of the internes in our hospitals. The exercises should be made so interesting, and their purposes so carefully explained to the patients that everyone would enter into the game with the idea of getting the greatest benefit from it. Every hospital should be surrounded with sufficient ground space where outdoor exercises and games could be indulged in by these patients as a definite part of their therapeutic care. Instead of sending softened, physically and mentally dejected patients away from our hospitals as we do to-day, such methods would turn out strong, vigorous patients anxious to return to their employment.

From the standpoint of the medical profession the war will be of great value if we learn to use all of these therapeutic adjuncts in connection with the permanent treatment of our accident cases.

Surgeons in industry have made great strides during the last decade in the treatment of injured employees. They undoubtedly will be among the first to grasp this line of treatment which will give not only the best surgical end-result but the very best economic end-result.

CHAPTER XXXV

X-RAY IN INDUSTRIAL SURGERY

Five years ago very few industrial dispensaries were equipped with a complete x-ray laboratory. At the present time this is recognized as one of the most important accessories to the surgical dispensary and several plants have installed most up-to-date machines. An expert röntgenologist on the surgical staff is equally important.

When x-ray facilities are lacking in the plant dispensary equipment injured employees who, in the judgment of the surgeon, actually

Fig. 111.—*X*-ray room in doctor's office. (*Courtesy of Ford Co.*)

need x-ray examinations, are referred to some outside hospital or laboratory. The charges for such work average approximately five ($5.00) dollars per case. Naturally the management requires and the surgeon is desirous to keep the cost of the surgical work at a minimum. Therefore, he refrains from sending many injured employees for such examinations unless there is a very definite indication. Whereas, if an x-ray laboratory was close at hand which could be used at approxi-

mately very little expense per case, many of these patients would receive such an examination at once.

As a result of this short-sighted policy the delayed x-ray examination is often a direct cause of the prolonged disability. Any industry where a sufficient number of accidents occur as to warrant a medical staff, wastes the price of an x-ray equipment and its operation every year by paying excessive prices for these examinations on the outside and by the prolonged disability in other cases which would have been benefited by an early radiographic examination.

We will take it for granted that every emergency surgeon to-day uses this method in all cases where the need is obvious. In addition to these, other patients are constantly reporting to the dispensary every day who should be x-rayed. The following types of injuries require this form of examination:

1. Every injured employee reporting to the office with a sprain should be x-rayed. Routine radiographic examination of so-called sprains will reveal approximately 10 per cent. of these are due to fractures, especially small linear fractures. Many of these, diagnosed at first as sprains and treated as such, fail to respond to treatment and after a week or two the surgeon decides to x-ray them, thus discovering the fracture. Immediate proper immobilization and rest of the part would have resulted in prompt recovery, but two weeks unnecessary time has been wasted. Some of these cases of delayed diagnosis of fracture fail to unite and wiring of the fragments or bone transplantation or other open methods become necessary. It is almost impossible for the surgeon to square himself with the patient when the diagnosis of a fracture has thus been unnecessarily delayed. Such mistakes can only be avoided by the routine x-ray examination of all injuries where the remotest chance of a fracture may exist.

2. All eye injuries due to foreign bodies, except such minor conditions as a cinder or dust not buried in the eye, should be x-rayed. It frequently happens that a small particle of steel or emery will penetrate the eyeball to a great depth without leaving any perceptible wound of entrance. Such foreign material is not discovered until weeks afterward when it has done irreparable harm. The loss of both eyes has followed these simple injuries whereas an early x-ray diagnosis would have prevented such dire results. The importance of the routine röntgen examination of eye injuries is illustrated by the following case:

Mr. J. R., male, 34 years old, was employed in a tool factory. His work necessitated occasional grinding on an emery wheel. Goggles were provided but were not kept in repair and the management did not require the employees to use them. One day while grinding, the wheel cracked and several pieces of emery were forcibly

thrown off. One of these struck the employee at the outer canthus of the left eye but he did not think any portion entered the eyeball. One of his fellow employees examined the eye but could find no sign of injury. Two days later, another employee playfully threw a wad of waste, used for wiping a machine, at J. R. and it struck him in the left eye. Two hours later this eye became inflamed and very painful. He reported to the boss and blamed his trouble on the waste which struck him in the eye. He was immediately referred to an excellent eye specialist who cared for all eye cases for the insurance company under which this concern was insured. Examination by the eye specialist failed to reveal any foreign particles as a cause of the conjunctivitis and iritis. He explained to J. R. that the badly inflamed condition of the eye was due either to diseased tonsils or an infected tooth. In order to satisfy the patient, he called another eye specialist, of excellent repute, in consultation and the latter agreed with this diagnosis. J. R., on the advice of these doctors, immediately had his teeth *x*-rayed, followed by the removal of two infected teeth. The eye condition persisted and the patient finally consulted his family physician. This doctor had attended J. R. in two attacks of appendicitis and so he advised him to get rid of this focus of infection. J. R. was referred to the author who operated on him for appendicitis, removing a chronically inflamed appendix, and ten days later the diseased tonsils were removed. The eye remained inflamed but during this period in the hospital, the pain was greatly relieved.

The insurance company was anxious to secure a settlement of this case and on the advice of their eye specialist, took the position that the slight injury complained of was not responsible in any way for the condition. The other eye specialist and the author contended that while the foci of infection in the patient's body might have been the source of infection, yet the injury was undoubtedly the predisposing factor. As the case was of intense interest from the medicolegal standpoint, I requested J. R. to report to the night clinic on Industrial Medicine and Surgery at Rush Medical College in order to demonstrate the condition to the students. In the midst of this demonstration, one of the students reminded the author that we had neglected *x*-raying the eye, one of the very things we had been teaching these students to do in every case of eye injury. The eye was immediately radiographed and to our great chagrin, a small foreign body was located deep in the eyeball.

This settled all legal controversy in the case at once. Two operations performed by the second eye specialist were required before this small body was successfully removed. It had undoubtedly penetrated the eye at the time the emery wheel broke.

Every physician and certainly every eye specialist as well as these

medical students should benefit by such lessons and routine x-ray examinations of eye injuries should become a fixture in the practice of medicine.

3. All deep scalp wounds should be immediately x-rayed. Fractured skulls will thus often be revealed when exploration of the skull by the surgeon may fail to show the condition.

4. Immediate röntgen examination of employees who have passed through rather serious accidents without receiving any apparently major injury is very important from a medicolegal standpoint. Such patients, when they reach home, may be influenced to magnify their minor injuries, especially if the nature of the accident warrants it. These patients will remain away from the surgeon and several weeks later may bring claim for broken bones, dislocations, etc. The following case illustrates the importance of this procedure:

Mr. J., 58 years old, a salesman, was called to a certain industry to consult with one of the managers regarding some special equipment which the concern desired to procure. In walking through the aisle in one of the departments, he stumbled over a small box which had been carelessly left there, and fell forcibly to the floor. He was taken to the doctor's office and thoroughly examined but no sign of injury was found. He complained bitterly of pain, however, and stated openly that the concern would have to pay him for damages. He exaggerated his symptoms and made so much fuss that the assistant surgeon who was in charge at the time, told him he was a fakir.

The management called a taxicab and sent Mr. J. to his home. Two weeks later his family physician called the author and stated that Mr. J. had sustained an injury of his right hip-joint at the time he fell and that motion in this joint was limited by an excessive callous formation. He had proven this condition by an x-ray examination. On inquiry, I found that Mr. J. was up and around although he suffered considerable pain in his hip. I suggested that the physician and his patient meet me at the hospital where a thorough examination could be made and if the concern was responsible, arrangements would be made for a settlement. This plan was agreed to. Examination of the x-ray plate showed a large amount of bony formation about the hip-joint. A chronic arthritis deformans was immediately suspected but, without mentioning this fact, I asked permission to have a new x-ray picture made at the hospital. This was done but instead of limiting the examination to the right hip, every joint in the patient's body was radiographed. Similar bony deposits were found about the left hip-joint, about the knee-joints and about one of the shoulder-joints. The röntgenologist reported that there was no sign of fracture about the right hip-joint but that this patient was suffering from a chronic arthritis deformans. Mr. J.'s family physician was convinced and

together we were able to persuade Mr. J. that his trouble had existed long before this fall. The claim for settlement was dropped.

An immediate x-ray examination at the time of the injury would have revealed the true condition and would have prevented this controversy which might have resulted in a very serious financial loss to this concern.

The x-ray is of great assistance in other types of emergency

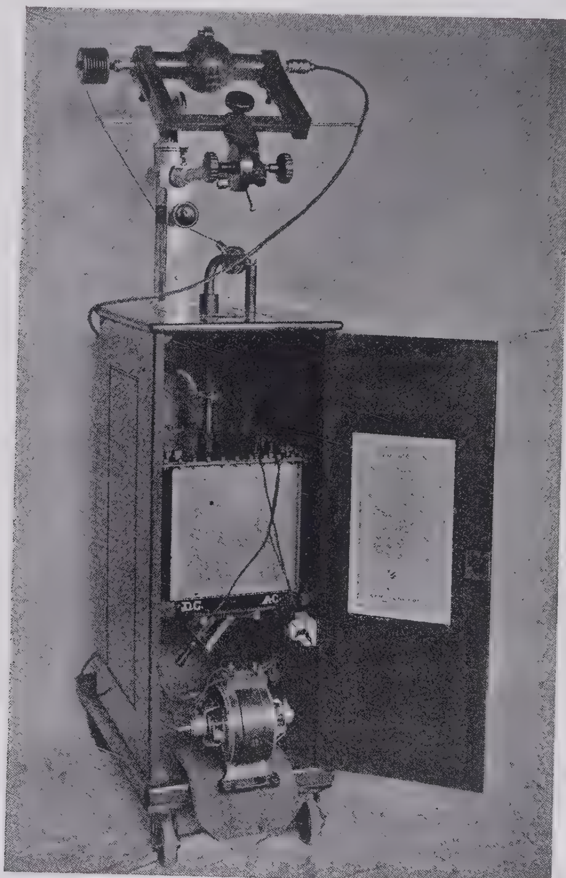

Fig. 112.—A portable x-ray machine especially serviceable in accident surgery.

surgery. Foreign bodies which have penetrated soft tissues can be immediately located and quickly removed by its use. Pieces of steel, broken needles and other such material, which often require an operation of one or two hours in order to remove, can be deftly taken out, the operation being performed in a dark room under the guidance of the fluoroscope. By looking through the fluoroscope the needle or piece of steel is located. An incision is made immediately over the

part, and a pointed artery forceps is introduced and guided by the eye until the foreign material is grasped. If the material cannot be immediately withdrawn the fluoroscope is put aside, the room lighted and with the forceps as a guide, the foreign body can be carefully dissected out.

War surgery has developed several different types of localizers to use in connection with the *x*-ray and these must be adapted to our industrial surgery. One of these appliances, the Granger localizer, is clearly described by the inventor in the April, 1918, issue of the *American Journal of Electrotherapeutics and Radiology.*

In the really up-to-date doctor's office in industry, every effort is made to thoroughly diagnose every case coming before the doctors. In order to do this, the *x*-ray is often a necessary adjunct to our diagnostic methods. Cases of pulmonary tuberculosis may be confirmed by this method whereas an early diagnosis might be delayed until clinical signs were manifested. Gastro-intestinal diagnosis or diagnosis of conditions in the urinary tract can be made in the plant dispensary by the röntgen rays.

Fig. 112 illustrates the U. S. Army bedside *x*-ray unit. It was designed to permit *x*-ray examination in the wards thus limiting the disturbance of the patient. This machine is adaptable to almost all the needs of an industrial dispensary and will reduce the cost of equipping a laboratory to almost one-half. It will also be of the greatest value in the hospital wards where the serious accident cases are under treatment. This is one of the advances in war surgery which can well be copied by industrial surgery.

No surgeon in industry to-day can afford to neglect *x*-ray examinations. To many managements the installation of this expensive equipment seems a luxury but it is the duty of every surgeon to demonstrate its economic value both to the employee and employer.

CHAPTER XXXVI

HAND INFECTIONS

Infections following injuries have been responsible for a very large percentage of the human wastage in industry. Their prevention therefore is one of the paramount duties of the surgeon.

In a few concerns, from which figures have been obtained before industrial surgery became a definite part of their organization, as high as 20 to 30 per cent. of all injury cases became infected. With the installation of preventive surgical methods, however, this complication has been markedly reduced.

It is difficult to obtain comparative figures from the different industrial clinics due to a divergence of opinion as to what constitutes an infected wound, and to the fact that many surgeons base their statistics only upon those cases which observe the rules concerning prevention.

A wound which shows the least evidence of invasion by pyogenic organisms should be classified as an infected wound. Some of these will show only redness and a slight swelling for a day or two and will then recover without definite pus formation; while others may show no local sign of infection but a slight or marked lymphangitis will develop only to disappear in twenty-four to forty-eight hours without any further complications. I include such cases as these in my statistics as well as the wounds exuding pus.

One surgeon reports that he has one infected case in every 1000, and another states that one out of every 991 injuries becomes infected. Both of these surgeons consider only cases showing definite pus as infected, and both agree that they have many other infected cases to treat but these occur in employees who failed to report to the doctor at once, or who removed their dressings and otherwise neglected treatment.

In the author's experience only 0.4 per cent. of the 26,616 more recent accident cases became infected where the employees observed all rules about reporting to the doctor at once and continuing constantly under treatment until the wound was healed (Table 18).

Each year has seen a gradual reduction in the number of infected cases, but we still have a number of such to treat. As explained elsewhere this is due to the fact that employees still fail to report to the doctor at once; still refuse to consider very slight wounds worthy of any attention, just as you and I persist in neglecting the little scratches

and abrasions we receive almost daily; and still neglect to continue under treatment or persist in tampering with their dressings. Many of these employees report to the doctor with the wound already infected (Fig. 113).

The following table shows the percentage of all infections as compared with the total number of accidents each year, for a period of five years. It illustrates three points very well, namely, that the number of infected cases made a very decided drop upon the introduction of more active preventive measures; that the percentage of infection cases is decreasing year by year (about 80 per cent. of these occur among new employees); and that the employees are reporting more and more to the doctor as shown by the increased number of accident cases.

Fig. 113.—Cellulitis of forearm from a neglected slight abrasion of the elbow. Injured Oct. 3d, reported for treatment Oct. 10th. Immediate treatment would have prevented the infection and no disability. This delayed treatment caused two months lost time from work and cost the employer three hundred and forty dollars.

In the cases for the last four years shown in this table only 49 became infected after using iodin at once and reporting to the doctor at once; 80 became infected after reporting to the doctor at once but failed to use iodin in the department. None of these were sufficiently infected, however, as to require an incision nor to remain away from work on account of the condition. The remaining 2436 infected cases failed to observe these rules concerning the use of iodin at once and the reporting to the doctor at once; 71 per cent. of these required incision of the infected part; and all employees in this group lost a total of 9744 days from work or an average of four days per man. The economic waste to industry is surely quite evident.

Infections as a rule follow minor accidents, and these are by far the most difficult type to prevent. Infections following minor injuries to fingers and hands make up at least 95 per cent. of the infected cases coming under treatment in the modern industrial clinic. Therefore it is very essential for the surgeon in industry to master all details concerning the prevention and treatment of hand infections.

TABLE 18

	1912	1913	1914	1915	1916
1. Total number of accidents.......	2693	4970	5971	7760	7925
2. Total number of infections.......	772	710	655	586	610
(95% hands).................	(28.6%)	14%	10%	7.5%	7.6%
3. Infected cases where iodin was used in department and then reported at once to doctor....................	No record	18	16	5	10
4. Infected cases where iodin was not used in department but reported at once..........................	No record	28	28	12	12
5. Infected cases where these rules were not observed	No record	668	611	569	588

The part played by hand infections in the economy of the industrial world is shown by the following statistics and statements from various industries and accident insurance companies:

1. From 4971 accidents, 11 per cent. became infected. Total disability from these accidents was 13,000 days, and 20 per cent. of this was due to the infections.

2. From one of the stockyard plants:

Seventy-five per cent. of disability from hand injuries is the result of infections; 25 per cent. of disability from hand infections is due to other causes, such as broken bones, etc.; 90 per cent. of these hand infections report late, after the infection has developed; 75 per cent. of their hand deformities are the result of infections.

3. Figures obtained from the claim departments of five of our largest accident insurance companies:

(*a*) Fifteen per cent. of the total disability is due to hand injuries. In 20 per cent. of these hand injuries, the disability is due to infections.

(*b*) Seven per cent. to 9 per cent. of the total disability from all accidents is due to hand infections.

(*c*) From 1000 consecutive cases, 5.7 per cent. of the total disability was due to hand infections (chiefly business men insured).

(*d*) From 15 to 20 per cent. of the total disability is due to hand infections. It depends on the type of work done by insured. When engaged in heavy work, where the injuries are usually serious, the infections are less, but if engaged in light work, where minor accidents are the rule, the infections are greatly increased.

(*e*) Of all hand accidents, it is estimated that 65 per cent. requiring disability are the result of minor injuries which have become infected; 35 per cent. requiring disability are due to other injuries, as broken fingers, lacerations, crushing injuries, etc.

In talking with a number of company surgeons and managers of

claim departments, I find that no definite statistics are available on this subject. They all agree, however, that:

1. Hand infections cause a high percentage of their disability.

2. Over 50 per cent. of their hand deformities are the result of infected injuries.

3. A great many amputations result from neglected, infected fingers (Fig. 114).

4. Hand infections are usually the result of minor injuries, such as pin pricks, nail wounds, splinters, scratches, small cuts, cracked hands, blisters, contusions, and abrasions. Such minor cases, as a rule, do not report to the doctor until the infection has developed.

FIG. 114.—Ankylosed middle finger following neglected hand infection. This finger was later amputated in order to give a better functional result.

5. Severe hand injuries, such as extensive lacerations, or severe crushing injuries, seldom become infected. The nature of these injuries is such that the patients are forced to consult a doctor at once.

6. That early treatment of all accidents, no matter how slight, would reduce infections to a marked degree.

PREVENTION

Prevention of infections is one of the most fertile fields of endeavor open to the company surgeon. It is the "Safety First" movement for the injured. A careful study of the etiology of every infection will show that the majority are due to preventable minor accidents, and by a removal of these causes a great reduction in infections will ensue. As an example, the lining of bins which had become loosened was the frequent cause of injuries which became infected. In every case, a notice was sent to the manager, pointing out the preventable

nature of this accident, and in one year the injuries from this source were reduced from 75 to 10. The same procedure was followed in the case of broken baskets, exposed ends of wire, nails on the floor, pins in packages, etc., all resulting in a decrease in minor accidents and, therefore, in infections.

Tincture of iodin is the greatest protection against infection that can be used. Every industry should supply each department with a bottle of tincture of iodin and another bottle containing applicators, and should instruct each employee to paint every wound, no matter how slight, with the tincture of iodin at once, even before reporting to the doctor. The importance of its use should be pointed out to the department foremen again and again, in order that they may instruct each new employee as to its value. (See Fig. 75.)

The value of tincture of iodin as an antiseptic par excellence has been pointed out in the chapter on First Aid.

The importance of early reporting to the doctor for a dressing is not only demonstrated by the figures in Table 18, but by the fact that major injuries, which force the employee to report at once, seldom become infected.

Dr. Frederick C. Warnshuis declares that immediate reporting and proper treatment will reduce infection to less than 1 per cent.

Dr. Corwin of the Colorado Fuel and Iron Company states that if the injured employees will see the doctor at once and if the wound is not handled, washed or dressed before seeing the doctor, 99 times out of a hundred it will not become infected.

The following excerpt of a report made by a safety engineer of a large industry is very interesting especially as he feels that the immediate reporting to the doctor is of more value than the use of iodin. By checking up on these cases, however, it was found that many had stated that iodin was used in the department, but failed to indicate that this was sometime after the accident. This engineer says:

"The monthly accident report shows the distribution of infections according to cause and demonstrates that practically all infections result from slight injuries, such as, pin pricks, nail wounds, slivers, abrasions, etc., the total infections for the month being sixty-six. The figures show that only 4 cases out of the 66 resulted from injuries that were reported immediately to the hospital, which proves the efficiency of the hospital treatment. The balance were all reported anywhere from a few days to, in some cases, weeks later. Out of the 66 infections it was necessary to open 40.

"This report also shows that in 31 out of the 66 cases, iodin was used in the department, which proved that the use of iodin alone is not sufficient to prevent infections.

"The dressing report shows that the average number of dressings per

person for infections was 6.35, against 2.54 for uninfected cases; or, in other words, the patient loses about two and one-half times as much time in reporting an infected case as an uninfected case.

"The last classification probably is the most interesting, as it shows the loss of time cases. Nineteen of the 66 infected cases caused a loss of time of a quarter of a day or more. The total loss of time for these 19 cases was 202½ days, or an average of 10.6 days per case; and the time lost over a quarter of a day, due to infections, amounts to 23 per cent. of the total time lost from all loss of time accidents.

"Since it has been shown that the infections result from minor injuries which would not have developed into infections if they had been

Fig. 115.—Cellulitis of upper arm following a small scratch on the wrist from wall-paper. This employee had three disabling infections in the course of three months. His teeth were badly infected and on curing this trouble his tendency to "blood-poisoning" ceased.

reported immediately and would, therefore, only have required on the average 2½ dressings per case, it is fair to assume that the average time lost per case should not have exceeded ½ hour. So, in the time lost by one of the above 19 cases, or 10.6 days, about 180 uninfected cases might have reported.

"From these figures it would appear that the immediate reporting of all minor injuries will cut down the infections, and even though there will be an increase in the number of reported cases, the total time lost, and consequently the cost of the accidents, should decrease."

Another form of prevention is the removal of all predisposing causes for infection in the employees themselves. The generally run down, anemic, undernourished individual, or those suffering from chronic diseases, are more prone to injuries and injury infections. Thus, the discovery of the diseased employee by a periodical medical

examination of all employees is a valuable adjunct to any system of prevention. By proper advice many of these diseased conditions can be overcome; a change of work may be indicated in other cases, and the regulation of the employee's mode of living, both at work and at home, and as regards outdoor exercise, will correct a great many of the anemic, undernourished, and run down conditions. In girls, we frequently see recurring infections in the same individuals. A study of the case will reveal a marked anemia, the correction of which overcomes her tendency to infections (Fig. 115).

Tonsillitis, one of the chief causes of sick disability among employees, also plays a marked rôle in the cause of infections. In the winter months, when tonsillitis is the most prevalent, our infections are correspondingly high. The coincidence of tonsillitis and finger and hand infections was noted so often that I made a careful bacteriological study of a series of these cases, and, as a rule, the same germ was found to be the cause of both.

The following table shows this relationship. Note the increase in hand infections with the increase in tonsillitis. (These figures are taken from the same working force, with the same working conditions prevailing.)

Table 19

January and February, 1913. Total number cases of tonsillitis	327
January and February, 1913. Total number cases of hand infections	83
Total days disability from hand infections	63
Number of hand infections having tonsillitis at time or just before infection developed	15, or 18 per cent.

In 1914, we had in Chicago a serious epidemic of tonsillitis, of the streptococcic type.

January and February, 1914. Total number cases of tonsillitis	603
January and February, 1914. Total number cases of hand infections	117
Total days of disability from hand infections	208
Number of hand infections having tonsillitis at time or just before infection developed	32, or 27.9 per cent.

The greatly increased disability in 1914 was due to 24 very serious cases with marked lymphangitis and tenosynovitis, all of whom had tonsillitis. Twelve of these were due to a hemolytic streptococcus, and the same organism was found in the patient's tonsils. Twelve others had a marked lymphangitis, and while the organism was not ascertained, yet these were undoubtedly streptococcic infections and closely related to the tonsillitis.

The removal of the tonsils when diseased, therefore, would not only stop the sick disability and the spread of the disease throughout

a department as an epidemic, but would be a great preventive measure against infections.

A further and very important factor in the prevention of infections is a suitable emergency office, where the most aseptic surgical treatment can be rendered.

Thus the most valuable preventive measures to avoid infections are:

1. The use of tincture of iodin at once as a prophylactic measure.

2. The sending of every injured employee to the doctor for immediate dressing.

3. Removal of external causes for accidents—found in the working place.

4. Removal of predisposing causes for infections—found in the employees.

ACTIVE TREATMENT

When an infection has once developed, the best medical treatment is at times the most expensive, but in the long run, it is the most economical. Too often, a doctor hopes to save his patient loss of time, or, if he is a company surgeon, he hopes to treat the case and still keep him at work: thus he adopts what at first seems the most economic line of treatment, but, by so doing, frequently temporizes with the infection. The death-rate from hand infections among the medical profession is notoriously high. I believe this is due not so much to the peculiar nature of the doctor's work, wherein he is brought into close contact with diseased conditions, as to the fact that most doctors temporize with an infection which they have contracted, rather than adopt active treatment at once.

From a careful study of 1600 cases of finger and hand infections and their complications I am convinced that a radical form of treatment of all hand infections is the best and cheapest plan that can be adopted.

The initial cost of such treatment will exceed a temporizing effort, such as opening an infection in the office and allowing the patient to go about his duties, but the length of treatment and the complications developing from the latter method will far exceed that which follows the treatment of all infections as serious from their inception. In dealing with this subject from an economic viewpoint, it is not the actual cost of medical services which is referred to, but the actual economy to the patient and to the concern for which he works. The most perfect line of treatment must give:

1. The shortest disability, with a minimum amount of suffering, and the fewest hardships to those dependent upon the patient;

2. It must prevent permanent deformities, such as loss of function, or loss of fingers;

3. It must reduce the death-rate to a minimum.

These 1600 cases of hand infections were chiefly the result of minor accidents, such as the following, named in their order of frequency: pin pricks, splinters, abrasions from baskets, boxes, bins, etc.; lacerations from knives, scissors, and other sharp utensils; bruises and contusions, nail wounds, scratches from tin and wire. The greater portion of these infections were very slight causing no loss of time from work, and requiring from 3 to 10 dressings. Nevertheless, there was a certain disability connected with them, as an employee with a bandaged finger or hand has less working capacity than an

Fig. 116.—Slight infections, especially lymphangitis, are treated as serious from their inception. Rest, immobilization of the part and continuous applications of heat usually abort these in twenty-four hours. (Men's rest room, doctor's office.)

unhampered employee. Therefore, reduction in the total number of infections means a marked saving in this form of disability. It has been further reduced by careful attention to the simplest, yet adequate, dressing which can be applied. A certain number of the above infections became serious, requiring considerable treatment either at home or at the hospital, and caused an actual loss of time from work. Thus, the 1600 cases may be classified as follows:

(*a*) Mild, or causing no loss of time, 1189, or 74 per cent.

(*b*) Serious, or causing loss of time, 411, or 26 per cent.

In order to arrive at the best and most economic treatment of these hand infections, it is necessary for us to study the 411 cases

from the above table which were serious enough to require actual disability.

One of two plans of treatment was adopted in every case of hand infection; namely, ambulatory treatment, or hospital treatment. The

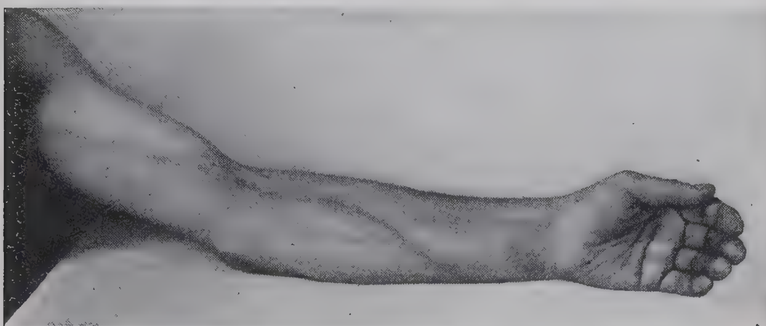

FIG. 117.—Lymphangitis of the arm from an infected abrasion on back of hand. Thirty-six hours in the hospital with continuous hot dressings relieved this condition without surgical interference.

ambulatory care consisted in opening the infected part at the doctor's office and allowing the patient to go home, reporting to the office for

FIG. 118.—Thenar space abscess from a neglected knife wound of thumb. Through and through drainage under a general anesthetic and hospital treatment for three days gave a prompt recovery without deformity.

subsequent dressings. Frequently these infections were incised with the use of a local anesthetic, but a general anesthetic was never administered in the doctor's office. When necessary, instructions were given

to the patient as to the use of hot dressings at home, and a nurse would call to see that these instructions were carried out. Naturally these infections were not as serious as those given hospital treatment, but in spite of this fact their average disability was greater. The absolute rest obtained by hospital treatment would cause more rapid recovery of these cases, but the idea of going to a hospital for a small, minor infection does not appeal to most patients.

When a hand infection showed signs of becoming at all serious, or threatened complications were apparent, we insisted upon hospital

Fig. 119.—Tenosynovitis of middle finger, with middle palmar abscess, result of cutting finger on steel tag. The patient was given ambulatory treatment after an effort was made to drain the abscess through a small incision on the flexor surface of the finger. Proper early drainage of the synovial sheath of the finger would have prevented this serious condition.

treatment. Here the infection could be opened under a general anesthetic of nitrous oxid gas, and the patient kept absolutely quiet in bed, with continuous hot, moist dressings applied until the acuteness of the condition had subsided. Likewise, many cases of threatened serious infection could be aborted and the necessity of opening these overcome by sending the patient to the hospital, giving him absolute rest in bed, preventing the movement of the infected part, and applying continuous hot packs for twenty-four or forty-eight hours (Fig. 117).

The use of a general gas anesthetic is one of the most valuable features of hospital treatment when it is necessary to operate on these

hands. The work of the operator is much more thorough, and incisions into the infected part are larger and better drainage is established. Wide-open, radical treatment of these infections means a much more rapid recovery; therefore, the advantage of this procedure (Fig. 118). The history of the treatment of hand infections is too often one of following the pus by making additional incisions. Frequently an infected hand is operated upon two, three, or even more times; whereas, if sufficient drainage is established at the first incision, subsequent openings are not necessary.

Ninety-five per cent. of the infected hands requiring two or more operations occur in those cases given office treatment (Fig. 119).

Besides reducing disability, a number of these serious hand infections would have resulted in permanent deformities if this radical form of treatment had not been adopted early. The accompanying table demonstrates the great advantages of hospital treatment for hand infections as compared to ambulatory treatment:

Table 20

AMBULATORY VERSUS HOSPITAL TREATMENT OF SERIOUS HAND INFECTIONS

	Treated at doctor's office and at home	Treated at hospital
Total number	253	146
Opened	210	78
Not opened	43 or 17%	68 or 46.5%
Total loss of time from work	2790 days	1088 days
Average loss of time, per case	11.02 days	7.4 days
Permanent disability, as loss of function or member	0	2[1]
Deaths	0	0

From a study of the above facts, I am positive that dangerous infections can be prevented and disability reduced by the early adoption of hospital treatment. The reasons, therefor, are:

First, the patient can be kept absolutely quiet and under better control than at home. This is very essential, as most of these infections are accompanied by a low grade fever.

Second, continuous hot dressings can be better applied by a trained nurse than by the relatives.

Third, better operations can be performed because of the general gas anesthetic, thus reducing the length of treatment, and necessitating fewer repeated operations.

There are twelve very serious, complicated cases of hand infections

[1] 25 per cent. loss of function by stiff middle finger. 10 per cent. loss of function by stiff thumb.

from this series which are not included in the above table, as these were first given home treatment, usually by their family physician, and later, as a final resort, came under our care at the hospital. The serious results of this delayed treatment are conclusively demonstrated by the following table:

Fig. 120.—A deformed hand the result of: *a*, Neglected nail scratch—failed to use iodin; *b*, neglected early surgical care; *c*, poor surgical judgment—a small incision when through and through drainage was indicated.

Table 21

SERIOUS, COMPLICATED CASES TREATED AT HOME AND TAKEN TO HOSPITAL AS FINAL RESORT

Total number	12
Opened	12
Total loss of time from work	379 days
Average loss of time, per case	31.5 days
Permanent disability, loss of function or member	5[1]
Deaths	0

A short résumé of two of these cases is typical of the entire series of twelve hand infections.

Miss K., 17 years old, pricked the middle finger of her right hand with a pin on January 5, 1914. This was two days after her employment. One of the witnesses suggested the use of iodin, but the patient did not think this necessary. January 10, five days later, she reported to the doctor's office with marked lymphangitis of

[1] First joint index finger right hand stiff, one case.
First and third fingers of right hand are flexed and stiff, one case.
Four fingers of right hand slightly flexed and stiff, one case.
Index finger left hand amputated, one case.
Index finger right hand amputated, one case.

the arm and considerable induration about the axilla, which extended onto the chest wall, subclavicularly and back to the border of the scapula. Swelling was quite firm and tender, but no inflammatory reaction of the skin was present. Temperature was 102°; pulse 100. Had a slight tonsillitis and pharyngitis, but otherwise the general examination was negative. There was no localized infection about the point of injury. The patient was sent to the hospital and under a

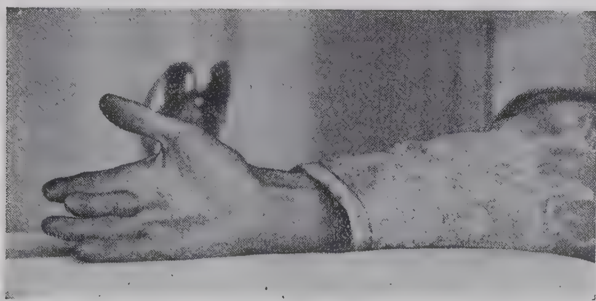

Fig. 121.

general anesthetic the axillary and the shoulder absesses were incised at three different points, and tube and gutta-percha drainage inserted. At least 8 ounces of thin, yellowish pus was evacuated. Large hot boracic dressings were applied to the site of operation and a second large hot dressing applied from the fingers to the axilla over the site of the lymphangitis. Subsequent course: In spite of the evacuation of the pus, the temperature continued to rise. The second day the

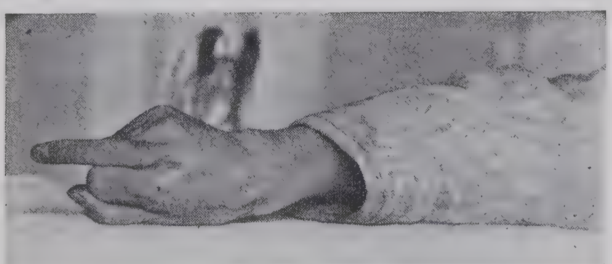

Fig. 122.

Figs. 121 and 122.—Show a deformed middle finger following a neglected splinter wound. This finger was later amputated in order to obtain a better economic end-result.

temperature was 103°, pulse 120; third day, 103½°, pulse 120; fourth day, 105°, pulse 140. The patient was exceedingly sick and showed all the signs of a general systemic infection. The fifth day, temperature was 104°, pulse 120; the sixth day, temperature 100° to 102°; and from this time on it gradually subsided, until at the end of two weeks it reached normal and remained there. On the third day, a

stock streptococcus vaccine was injected, and on the fourth day, a small dose (50 million) of autogenous vaccine, which had been prepared, was administered. A slightly larger dose of autogenous vaccine was given on the sixth day, and again on the ninth day. These vaccines were repeated every four days for four more doses. She left the hospital at the end of three and one-half weeks, and recovery was complete at the end of five weeks. The neglect of this minor injury and the late reporting after the trouble had started were the chief reasons for this girl's serious sickness.

Mr. E., an old employee, received a slight contusion of the hand on March 4, 1912. The cause of the accident was unknown. He had been under the care of his family physician because he did not think his work was responsible for the injury. The hand at first became swollen, then the forearm, which was badly inflamed and very

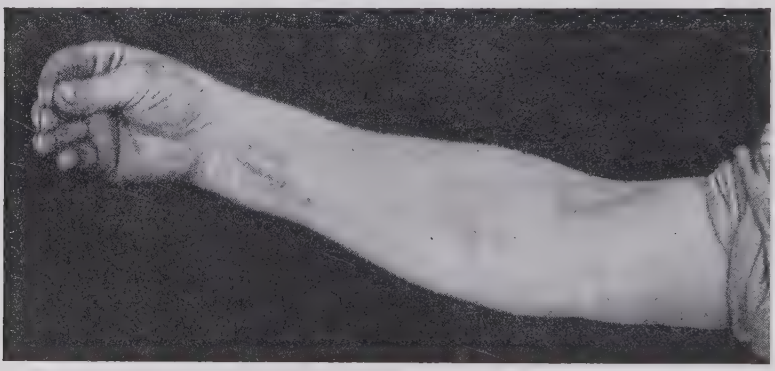

Fig. 123.—A deformed hand following a cellulitis of the forearm. This man was treated in his home by his family physician for two weeks. Numerous small incisions were made without adequate drainage. Recovery did not occur until he was taken to the hospital and the deep abscesses drained. This temporizing treatment caused four months disability and the permanent loss of function in the hand.

tender. This swelling increased until his family physician was called on the fourth day. Three small incisions were made on the flexor surface of the forearm and were extended through the skin to the fascia. A little serous exudate was found, but no pus. These incisions became infected, and superficial abscesses developed on the forearm during the next ten days. These were opened and drained by small incisions. The swelling in the arm increased to an immense size and the entire forearm assumed a dark-red, brawny appearance. The patient came under my care March 18 and was taken to the hospital. A diagnosis of diffuse cellulitis of the forearm was made, with large collections of pus in both the ulnar and radial bursæ and the intramuscular spaces. Under a general anesthetic, large incisions were made at each side of the forearm, just above the wrist-

joint, and the ulnar and radial bursæ drained by through-and-through drainage. A large incision was then made through the upper two-thirds of the forearm, slightly to the ulnar side of the middle of the flexor surface. From this incision, all intramuscular abscesses were opened and drained. Infection was found to be a staphylococcus pyogenes aureus, and autogenous vaccines were made and used for several weeks. This man ran a temperature from 99°

FIG. 124.—Deformed hand following severe hand infection from neglected pin prick.

to 102°, with a weak thready pulse of 110 to 130 for at least six weeks. He gave the typical picture of sepsis. Acute nephritis developed, but gradually disappeared with recovery from his infection. For several days we despaired of this man's life. Recovery was practically complete about the middle of June, some three months later. Permanent deformities remain in this case. His four fingers are

FIG. 125.—Same as Fig. 115 three months later. This deformity was overcome by the constant use of a hammer.

flexed about 25 per cent. and cannot be completely extended nor closed.

This man's long disability, loss of function in the fingers, and the narrow escape from death were all the result of neglecting a simple injury, trying ambulatory treatment when hospital treatment should have been instituted together with inadequate drainage during the early course of the disease (Fig. 123).

The remainder of the cases in this group all neglected prophylactic measures at the time of the minor injury; a few were given first aid by fellow employees, as attempted removal of a splinter from the hand, in which case a portion of it was left in; all reported to the doctor from three days to one month after receiving their injuries; and four were given office treatment by their family physicians for a few days before being sent to the hospital. The five cases of permanent deformities, two with loss of fingers, are the direct result of the above negligence.

ECONOMIC VALUE OF PROPER DIAGNOSIS OF LOCATION OF PUS AND PROPER SURGICAL INTERFERENCE IN HAND INFECTIONS

Many cases of prolonged disability and also of permanent deformities result from a wrong diagnosis of the type of infection, a lack of understanding as to the location of the pus, and inadequate surgical interference—either too small incisions, or at times too large

FIG. 126.—A lateral incision, instead of on the flexor surface, over the tendon, furnishes better drainage and prevents deformity.

or too many incisions. Some of our cases of serious deformities come under this heading. Kanavel has demonstrated conclusively that there are certain definite spaces where infection, entering at various points on the hand, tends to spread. The most important of these spaces are:

1. The synovial sheaths about the tendons—the commonest site for the more serious forms of hand infections (Fig. 126).
2. The lumbrical and subaponeurotic space at the edge of the palm, where the so-called "collar-button" abscesses form.

3. The thenar space.
4. The middle palmar space.
5. The hypothenar space.
6. The radial bursa.
7. The ulnar bursa.

Through the last two spaces, infections usually spread from the hand to the forearm.

A knowledge of these spaces and the location of injuries that usually lead to their involvement should be had to properly open and drain these most serious types of hand infections. To know the relations and boundaries of these various spaces is just as important as it is to know where to enter the abdomen for the appendix or to reach the gall-bladder. In other words, infections about the fingers and hand have too long been considered of rather minor importance and

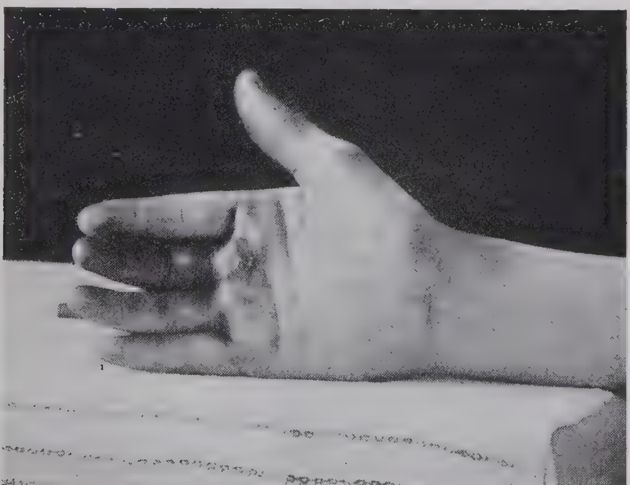

FIG. 127.—A "collar-button" abscess from a neglected infected callous.

have been treated accordingly, whereas they must be recognized as very grave, serious conditions and must be studied and treated by the most approved surgical procedure. Every possible adjunct, both locally and constitutionally, must be employed to hasten recovery and prevent a spread of the infection.

A classification of the various types, as to location, of the 411 cases of hand infections which were serious enough to cause disability will give the relative frequency of the involvement of these different spaces.

I. The types of hand infections, named in their order of frequency, which were given ambulatory treatment:

(*a*) Paronychia	90
(*b*) Superficial or subepithelial abscesses	72
(*c*) Abscesses in superficial connective-tissue spaces—cellulitis of hand	45
(*d*) Carbuncular infections	20
(*e*) Lymphangitis of arm from hand injury	13
(*f*) Felons	10
(*g*) Collar-button abscesses (distal edge of palm)	3
Total	253

II. The types of hand infections, named in their order of frequency, which were given hospital treatment:

(*a*) Lymphangitis of arm from hand injuries	59
(*b*) Felons	24
(*c*) Tenosynovitis	24
(*d*) Abscesses in superficial connective-tissue spaces—cellulitis of hand	14
(*e*) Collar-button abscesses	7
(*f*) Carbuncular infections	5
(*g*) Middle palmar space infections	5
(*h*) Paronychia	3
(*i*) Thenar space infections	3
(*j*) Hypothenar space infections	2
Total	146

III. The twelve very serious cases where active treatment was adopted late were characterized by having more than one space involved, or some other form of complication, as follows:

(*a*) Diffuse cellulitis of hand and arm and general sepsis.
(*b*) Middle palmar space and ulnar bursa.
(*c*) Tenosynovitis and necrosis of bone of index finger.
(*d*) Tenosynovitis and multiple abscesses of arm.
(*e*) Diffuse cellulitis of hand and arm.
(*f*) Tenosynovitis, middle palmar abscess, and necrosis of bone.
(*g*) Thenar space, middle palmar space, and ulnar bursa.
(*h*) Tenosynovitis and middle palmar space.
(*i*) Superficial abscess of hand, lymphangitis, and axillary abscess.
(*j*) Superficial abscess of hand, lymphangitis, axillary abscess, and subclavicular and subscapular abscess of chest wall and general sepsis.
(*k*) Lymphangitis, axillary abscess, and subclavicular abscess of chest wall.
(*l*) Lumbrical space abscess and necrosis of bone.

Besides definitely ascertaining the location of the pus, a differential diagnosis of the type of infection should be made in every case showing signs of becoming serious. In this way complications which may be expected from more virulent organisms can be anticipated and guarded against. Again chronic infections which have resisted all treatment may be found due to some obscure condition or rare organism. For example, a young man scratched his forearm upon a

piece of tin nailed to a bin. It became infected and resisted all treatment for a period of two weeks. The first cultures were reported as negative. Finally cultures were again made and were reported as "no growth" after forty-eight hours. After seventy-two hours, however, the laboratory assistant reported that we were dealing with a case of Sporotrichosis caused by the Sporothrix Schenkii. The line of treatment was modified accordingly and recovery resulted shortly afterward. (See Fig. 128.)

FIG. 128.—Case of sporotrichosis (sporothrix Schenkii). Failure to diagnose the cause of this infection delayed recovery at least two weeks.

The operative procedures and the general and local treatment required for hand infections is dealt with in detail by Kanavel in his book on "Hand Infections." Likewise many interesting contributions on this subject have been made to the medical literature as a result of the various experiences in war surgery. The reader is referred to these sources.

Both Dr. Sherman of the Carnegie Steel Company and Dr. Corwin of the Colorado Fuel and Iron Company have introduced the Carrel-Dakin method of combating infections into their industrial surgery

Fig. 129.—Cellulitis of the arm from an industrial injury being treated by the Carrel-Dakin method.

Fig. 130.—Sterile instruments and tubes are handed to doctor by nurse with sterile instruments.

and claim most excellent results. These two surgeons visited France and made personal studies of this method of treatment which may account for their results. It is quite evident that many of the un-

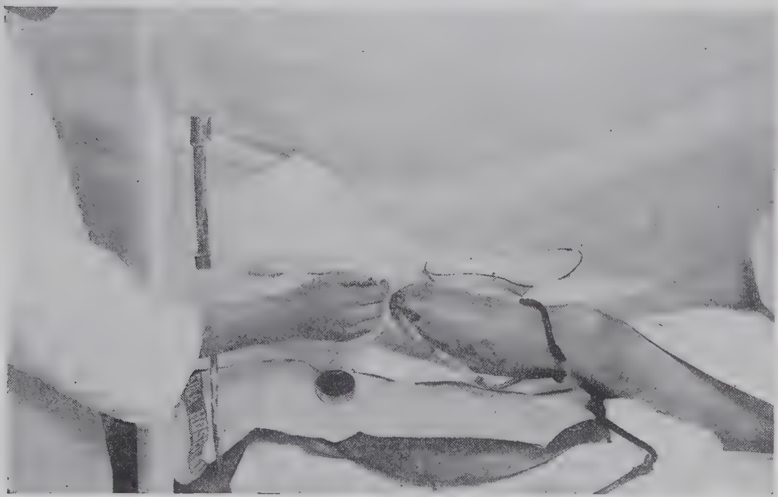

Fig. 131.—Smear of wound being taken for bacterial count.

favorable reports concerning the Carrel-Dakin treatment are due to lack of familiarity of applying the method (Figs. 130 to 135).

The Dichloramine-T treatment of infections has also come into

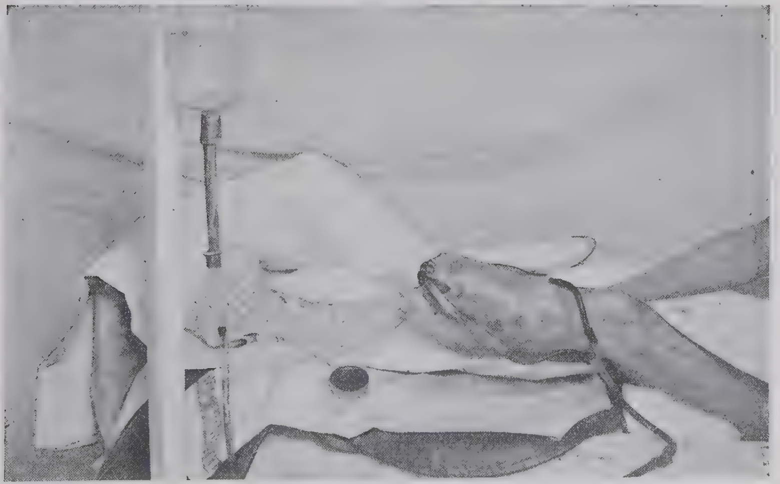

Fig. 132.—Wound with Carrel tubes inserted ready for external dressings.

prominence since the war. Dr. Lee of Philadelphia has published numerous reports concerning its use. In my own clinic this has proven very efficacious in securing the more rapid recovery of many

chronic infections, as for instance the infected abrasions or a periostitis with ulcer formation over the shin bone. It is an excellent method of treatment for old chronic hand infections.

FIG. 133.—Gauze taken from sterile package with sterile instruments.

Many surgeons treat these hand infections by the continuous hot boric dressing method. Results depend upon the frequent changing

FIG. 134.—Sterile gauze applied to the wound.

of these dressings otherwise they soon become saturated with the infected pus—truely pus dressings instead of boric dressings.

Adequate drainage, hot dressings frequently changed, with immobilization of the infected part have proven very beneficial in the past. Careful records and comparison of results between this and the newer principles regarding infection treatment are necessary before determining which will give the desired end—the quickest recovery with the least loss of function.

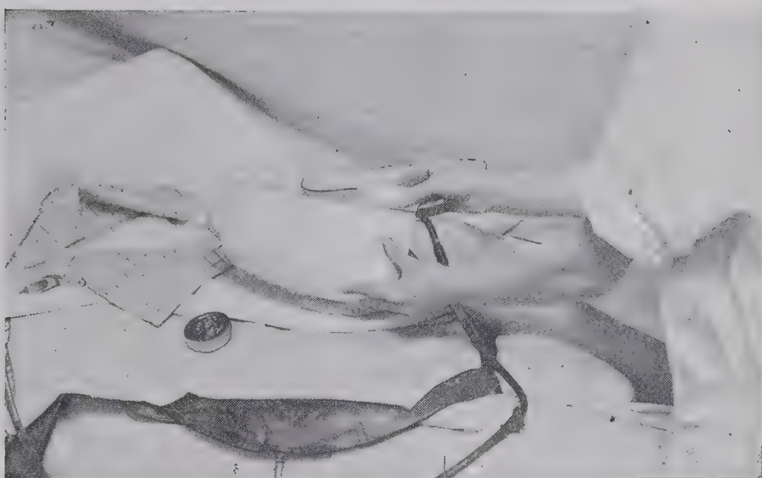

FIG. 135.—Bandaging wound over the tubes and dressing. (*Clinic of Dr. Corwin.*)

CONCLUSIONS

The treatment of hand infections, therefore, in order to give the best results from every viewpoint must include:

1. The proper preventive measures, especially the prophylactic use of tincture of iodin and the early reporting of all minor injuries.

2. The treatment of hand infections as a serious surgical condition from their inception, and whenever indicated the adoption of hospital treatment early.

3. The proper and early diagnosis of the type and nature of infection and the exact location of the pus.

4. A proper incision of the abscess in order to establish adequate drainage and yet not spread the infection to other spaces.

5. The immobilization of the infected part and the frequent changing of the dressing whatever method is used.

CHAPTER XXXVII

FRACTURES

Prior to the war industrial surgery furnished one of the greatest opportunities for advancement in the handling of fracture cases. If we combine with our past experiences the vast material concerning fracture treatment which has accumulated during these four years of war, still greater advances in this branch of surgery will be made.

Fractures undoubtedly contribute more to the absentee rate among injured employees than any other type of injury. The claims for permanent disability are also more frequently the result of fractures than from any other cause. Thus it is evident that greater attention must be paid to the handling of fracture cases from the standpoint of, first, their prevention, and second, their treatment from an economic point of view.

The number of fracture cases can be greatly reduced in any industry by the methods described for preventing accidents. In addition to this the spirit of prevention must invade the entire working force so that every employee will be on the lookout for obstructions and pitfalls which can cause a fellow employee to fall and injure himself. In my experience *falls* have been responsible for 70 per cent. of the fracture cases presenting themselves for treatment. During the first year of the war out of 24,000 injuries due to accidents from industrial causes in the army, 12,626 were due to falls, and of this number 2,147 sustained fractures.

Therefore, a campaign directed toward the removal of obstructions, the protection of high places, the fencing in of excavations, the testing of ladders and elevations before using them, the repair of broken floors and sidewalks, the proper attention to the shoes of employees, and the eradication of all other things making falls possible, will certainly prevent at least 50 per cent. of the fracture cases.

The following are the high lights in the economic treatment of fractures:

1. The use of the *x*-ray. Every fracture should be *x*-rayed before and after it is "set" and always from two or more different angles. This is often neglected because of the expense attached to the procedure, but one cause of faulty functional result will cost more than *x*-raying every fracture case for a year. The reduction and coaptation of many broken bones can be facilitated by the use of the fluoroscope. Every

industry where a fair number of fractures occur among the employees should have a surgical dispensary equipped with an x-ray apparatus.

2. The immediate immobilization of the fractured member. The improved results in fracture work in many industries has been due to the presence of a surgeon on the job, who could properly immobilize the part before transportation was attempted. This principle has been further strengthened by the work of the regimental surgeons at the front. When a surgeon is not available then first aid assistants should be thoroughly trained in these methods of fixation and transportation.

Major Horace Allen (The Military Surgeon, April, 1918) has made a suggestion relative to the proper stretcher for severe fractures of the

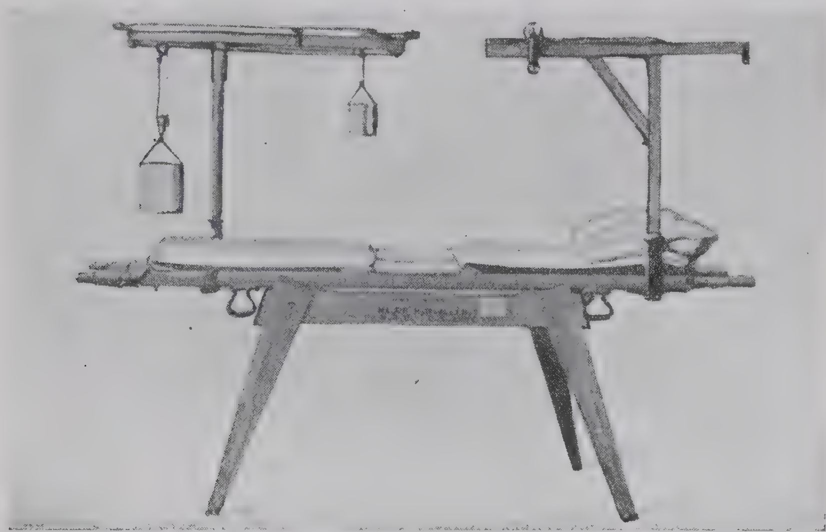

Fig. 136.—A stretcher table. (*Allen, from The Military Surgeon.*)

Such a stretcher would enable the transportation of a severe accident case to the doctor's office where emergency treatment could be rendered, and later transported to the hospital—all without unnecessarily disturbing the patient.

spine, pelvis or femur which can very well be adapted to industrial surgery. It has been customary to carry these severe fracture cases to the surgical dispensary where emergency care is rendered. When the ambulance arrives the patient is transferred to the ambulance stretcher and on arriving at the hospital he is again transferred to the hospital bed. These movements are exceedingly painful to the patient and are liable to interfere with the best functional results. Allen suggests using a padded stretcher with legs which can be used to transport the patient and also as his bed in the hospital for a few weeks. He claims that the patients find the stretcher bed more comfortable than a hospital bed. It would undoubtedly facilitate the handling of the case

by the doctor and nurse. Major Allen thus describes the accompanying illustrations:

"A litter resting on four sticks passed through rectangular holes in the tread into the sockets at the top of the stirrups. At the head and foot of the litter are adjustable extensions. Near the head end is a head rest which is automatically locked in place when the spreader bars put the canvas on the stretch. In the middle is the bed-pan, attached to the canvas in such a way that it has to be open when attached and has to be closed in order to be detached. Near the foot end is a substitute for the Balkan frame, namely, a swinging traveling

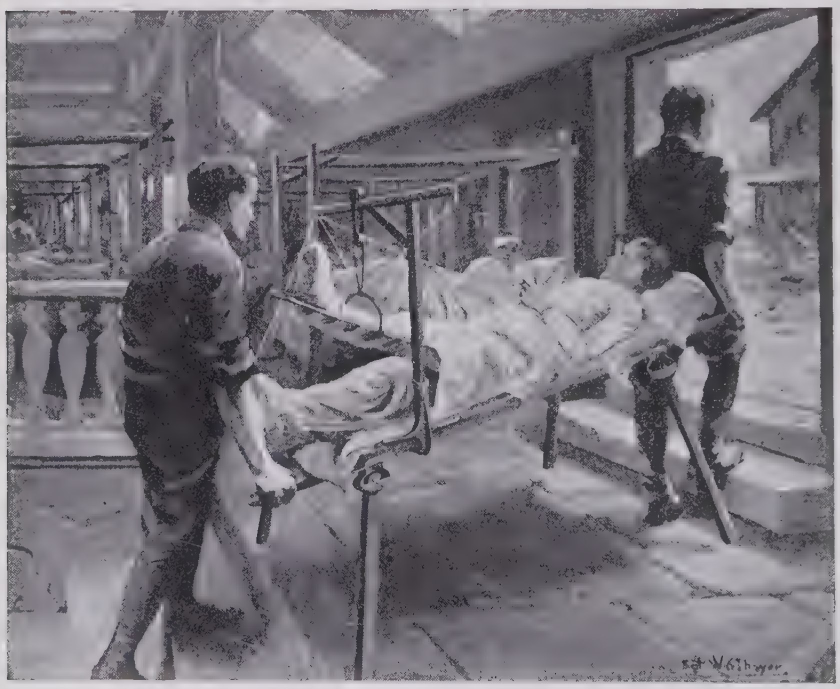

Fig. 137.—The practical use of a stretcher bed in an army hospital. (*From a Painting by Thayer.*)

crane, balanced or unbalanced, capable of giving any variety of movements, or standing stationary. It can be attached or removed in less than one minute. The attachment piece crosses underneath the poles of the litter."

Some of the possibilities of such a stretcher bed are well illustrated in the painting "Why Not" by Sergt. Thayer, of the Army Medical Museum (Fig. 137).

Quicker and better results will be obtained if more attention is paid by surgeons to the prompt immobilization of fractures and to the proper facilities for their transportation.

3. The use of an anesthetic for reducing and fixing the fracture.

4. The early use of passive motion, massage and muscular exercises in all fractures. In the majority of broken bones after they have once been properly set and fixed it is perfectly safe to gently loosen the splints and give massage. The sooner passive motion and then active motion can be established the better will be the functional result. For this reason I avoid as far as possible the use of the circular plaster cast which prevents these methods of maintaining tone and function in the adjacent muscles. The surgeon treating fractures must not be content to put them up in a cast and not see the case again for a month or six weeks when the cast is removed. These patients require almost daily attention to obtain the best results.

5. The therapeutic adjunct of "keeping these patients busy" is of the greatest importance in shortening their period of disability. If the fracture is of such a nature as to confine the patient to bed, then "bedside occupations" should be provided. He should be given regular exercises in bed and taught how to exercise the muscles in the injured member without moving the adjacent joints. For the ambulatory cases work is the best medicine. These men tend to develop habits of loafing and postpone as long as possible their return to work. If, however, they are assigned easy tasks at the plant they can often return to work within a week after the injury, before the habit of loafing has developed. Thus I seldom allow my cases of fractured arm to remain away from work until recovery is completed. Dr. Farnum states that 80 per cent. of all his fracture cases are placed at some light, useful work within a week after the accident and the period of disability and the actual time the patient is under treatment have been greatly reduced thereby.

6. The judicious and early use of massage, mechanotherapy, and hydrotherapy will be found of the greatest value in overcoming the swelling and sluggish circulation in the extremity which has been immobilized for some time. We have followed a very uneconomical practice in allowing these conditions to gradually disappear of their own accord. Proper active treatment of a fracture throughout will eliminate the chronically swollen extremity which worries the patient so much and tends to prolong his disability weeks longer than is necessary.

For the treatment of specific fractures the reader is referred to any one of the excellent text-books on this subject. Nevertheless so many advances have been made in the treatment of fractures during the war that it is desirable to point out the most important improvements which are applicable to industrial surgery.

Dr. Irving Clark, of Worcester, Mass., had an unusual experience in fracture work during his eight months service with the American

Red Cross in France. He is also familiar with the problems which confront the industrial surgeon. Therefore, the author persuaded him to write the following article which is pregnant with suggestions applicable to this field of surgery:

"The treatment of fractures in industrial surgery may be divided into the treatment of simple and compound fractures. The treatment of simple fractures is divided into emergency and permanent treatment.

"Fractures occurring in industry are more severe than in ordinary practice because of the frequency of direct violence as a cause.

EMERGENCY TREATMENT

"Emergency treatment, while it can be carried out by a foreman trained in first aid, can in most cases be done better by the industrial surgeon.

"The emergency treatment consists of immediate immobilization in approximate alignment. This is obtained by traction and fixation, the fixation being so managed that the patient may be transferred to the hospital with a minimum of pain and shock. The permanent treatment consists in complete reduction and immobilization. In the treatment of fractures, there are four basic rules which are always safe to follow: Always have a good *x*-ray. Always use a general anesthetic. When reducing endeavor to obtain an interlocking of the fragments end to end, and immobilize in the position which will hold them in alignment with the least strain. When one of the fragments is held in a certain position by muscular spasm, the other fragment should be approximated to it and held in alignment with it by the splint.

"In a brief chapter such as this, it is impossible and unnecessary to consider the classic fractures, their reduction and the various forms of splints which can be used for their retention. Information of the most complete kind can be obtained in such text-books as Scudder's 'Treatment of Fractures,' Moorhead's 'Traumatic Surgery,' Stimson's 'Fractures' and Cotton's 'Fractures of the Joints.' Our efforts here will be to point out slight modifications of standard dressings and splints, and particularly to bring out the most recent work done in the war hospitals where fractures play a very important part.

"The industrial surgeon will do well to limit his emergency splints to as small a number as possible and not only know himself, but have trained his assistants, in the rapid application of each type. The following list of splints may prove useful as a basis:[1]

[1] At the beginning of the war over 200 different types of splints were used by the English. A committee on standardization first reduced this number to 112 and later to less than 50. The medical department of the A. E. F. early standardized the fracture work in our army so that eight varieties of splints made up the total used. (Author's note.)

"1. Six basswood splints cut in 16-inch lengths—trade width. It is well to have these all ready thickly padded with sheet wadding. For use in fractures of forearm.

"2. Two Thomas hip splints, army pattern. For use in fractures of the femur. The splint consists of a padded ring, slightly ovoid in shape, set upon two iron wire rods at an angle of 55 degrees with the outer rod. The rods are three-eighths of an inch in diameter. At the inner and shorter of these two rods the ring is twice as heavily padded as at the outer, and the ring is symmetrically depressed at either side of the inner rod to form a concavity which hugs the ischial ramus and fits snugly around the ischial tuberosity. The long and short diameters of this ring vary since the splint as used by the British army comes in several sizes, but a ring of average size measures across the long diameter 9½ inches, and across the short diameter 9 inches. The outer rod descends from the ring vertically for 2½ inches and

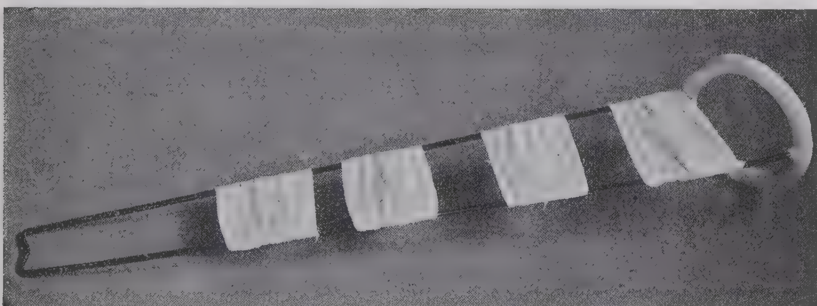

Fig. 138.—Thomas splint.

then inclines toward the inner rod. At the starting point of the inner rod the two wires are 8½ inches apart and at the bottom they are continuous in an indented or notched end, 3½ inches in width, about which the traction bands are wound and knotted. The outside rod is 47 inches in length and the inside rod 42 inches in length, The space between the rods may be varied by bending them outward and inward. If desired the splints may be bent at the knee (Fig. 138).

"3. Twelve wooden tongue depressors, thickly padded. For fractured fingers.

"Supplies for use in emergency treatment of fractures.

"1. Twelve bandages 3 inches wide—6 gauze, 6 muslin.

"2. Six packages large safety pins.

"3. Two folded pillow cases for axillary pads.

"4. Four triangular slings, army design.

"5. One roll of Z. O. adhesive plaster, 5 yards × 12 inches. For fracture of clavicle and for retention of basswood splints.

"6. Two pillows with pillow cases. For leg fractures.

"The standard methods of applying these splints and supplies to the most frequent fractures will be found in the Red Cross First Aid Manual.

"There are certain points about their application which are important. Little difficulty will be experienced with the emergency treatment of fractures of the clavicle and humerus. These can be treated in the classic way with slings and bandages.

"**Fractures of the forearms** should always be splinted with double boards and the forearm should be supported at right angles to the humerus.

Fig. 139.—Strapping of chest for fractured ribs. Note that plaster extends two-thirds around the body and that the straps overlap, being applied from below upward.

"**Fractures of the ribs** should be at once immobilized with adhesive plaster. The strips should be four inches wide, and long enough to encircle two-thirds of the chest (Fig. 139).

"The strapping should be applied from below upward, each strip overlapping the one below. Too much snugness cannot be obtained. The strap should be put on with pressure.

"**Fractures of the thigh** should be treated by the Thomas hip splint. The method of applying this is as follows: With the patient lying in a comfortable position apply traction to the injured leg. 'Adequate and comfortable traction can be secured with a bandage, which is always at hand and, therefore, most strongly recommended. Various ingenious substitutes have been suggested and employed and are wor-

thy of mention. A screw-eye may be inserted in the heel of the boot; a nail or skewer may be pressed through the shank of the shoe and cords attached to its projecting ends; a horseshoe shaped wire with inward facing prongs can be hooked over the welt of the shoe on both sides and a traction cord be attached to the ring of the horseshoe. These methods demand special articles sure to be lost or mislaid, while bandage traction is always available.'

"The technic of the application is important. Take a double length of four-inch bandage a yard and a half long. Place the middle of this traction band back of the shoe just above the counter. Wrap both ends across the instep and round under the sole in the usual figure-of-eight manner. Bring each end up on its respective side and carry its under the lateral part of the bandage behind the malleolus, then over this bandage and directly downward, thus providing two

FIG. 140.—Thomas splint hastily applied for emergency. Note hitch in region of ankle for traction.

lateral traction bands. The loops should be well back of the malleoli so that the line of traction is behind the ankle-joint. A generous pad should be placed over the instep beneath the crossing of the bands to prevent pressure. It must be borne in mind that grave injuries of the leg interfere with its circulation and that pressure sores develop from incredibly slight trauma.

"Slip the Thomas splint on gently and fit the ring well at the ischial bearing. Carry each traction band half around the corresponding uprights, passing one over and one under its upright, and then bring each one in opposite directions once about the notched iron piece at the lower end of the splint and tie with square half bow-knot. A nail or bit of wood slipped between the bands below where they have been brought about the uprights may be twisted as in a Spanish windlass to increase the traction at will (Figs. 140 and 141).

"A bandage about the whole splint completes the dressing. For

speed, this may be applied from above downward, as there is no danger of constricting the limb with a bandage carried outside the uprights of the splints.

"A coaptation splint is often used as a posterior splint to increase the support of the thigh. This is desirable but by no means necessary, as the dressing as above described gives adequate and comfortable support.

"*Transfer to the Stretcher.*—The stretcher should be provided with a heavy splint support which springs on to the side bars. The patient should be carefully lifted on to the stretcher by four bearers. The end of the splint should be slung to the cross bar of the splint support by a bandage, so that the leg clears the stretcher, and also tied to each upright of the splint support to prevent side sway.[1]

Fig. 141.—Thomas splint further applied before the application of bandage. Note bandages tied around leg in the region of fracture to set leg on splint. A further bandage may be applied over the whole for additional security, but the rigging as shown is sufficient for transportation for short distances.

"**Fractures of the leg** can usually be comfortably immobilized by a pillow splint. When the fracture is very severe and there is much pain and displacement the Thomas splint should be used.

"**Pott's fracture** and **fractures of the foot** can be best treated by using the pillow splint.

PERMANENT TREATMENT

Fractures of Upper Extremity

"**Fractures of Clavicle.**—In applying the classic Sayre adhesive plaster dressing, the following slight modifications have been found of advantage. The first consists of a pad of one thickness of Saddler's felt having a hole cut in it and applied over the olecranon. This prevents the cutting of the adhesive plaster which is so disagreeable.

[1] Major Kendall Emerson, British Jour. of Surgery, September 12, 1918.

The second modification consists of a strip of adhesive $1\frac{1}{2}''$ wide which surrounds the wrist and then passing over the affected clavicle, sticky side down, and is attached to the broad arm strap behind. A pad of felt over the affected clavicle helps to hold the fragments in position and avoids adhesive plaster pressure (Fig. 142).

"**Fractures of the Surgical Neck of the Humerus.**—This fracture is a fairly common one and has received considerable attention due to the difficulty of its retention. Jones describes its reduction and retention as follows:

"'*Treatment.*—Traction on the arm in the axis of the humerus, gradually abducting and rotating outward till the arm is at right

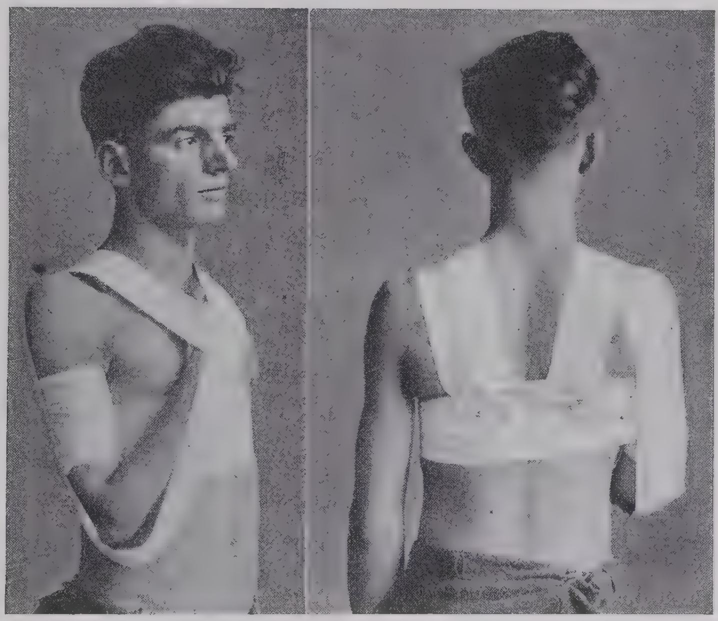

Fig. 142.—Modification of Sayre dressing for fractured clavicle. Note pads at elbow and over clavicle and additional strap extending from wrist over clavicle. The elbow strap is not put on in this case in the classical way as enough raising of the shoulder can be obtained without carrying the strap across the back, and the dressing is more comfortable for the patient. Note raising of right shoulder in cut.

angles to the body or even straight upward parallel to the side of the head, will disengage the lower fragment from the inner side of the upper fragment. In this position the line of traction of the pectoralis major, latissimus dorsi, and teres major is in the axis of the shaft, so these muscles no longer exert a lateral distorting force.

"'While an assistant is extending the limb in this way the surgeon with his hands feels when the bones have completely disengaged. He then asks the assistant to relax the tension on the limb, while he tries to guide the ends so that they engage end to end.

"'If they do engage, they can often be gently pressed together and made to lock sufficiently to allow the arm to be brought down to the side slowly and gently, and with a pad in the axilla the arm is securely fixed to the body, with the elbow bent to an angle of forty-five degrees and the wrist slung from the neck. These movements should be performed with gentleness and judgment to avoid injury to nerves and vessels.

"'Experience has shown that once this maneuver is successfully accomplished the ends are not likely to disengage, and all that is necessary is to wait for union and then gradually commence movement.

"'If the shape of the line of fracture is such that the fragments will not lock properly and, therefore, disengage when the arm is brought

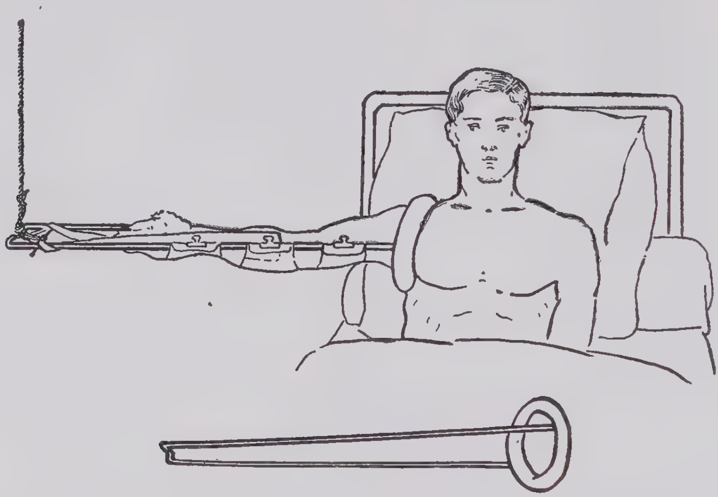

Fig. 143.—Thomas arm extension splint for severe fractures, usually compound, of the humerus. Note method of suspension and traction, the same as used in the Thomas leg splint. (*Manual of Splints and Appliances for the Medical Department of the United States Army*, 1917.)

down to the side, the arm must be fixed in the abducted position. In this position the line of traction of the pectorals and latissimus is practically the axis of the limb, and, therefore, will only pull the two ends toward each other and not laterally, and usually the fragments will not slip.

"'The whole arm, shoulder and upper limb, is swathed in one layer of cotton-wool. It is best to roll up a whole length of cotton-wool and apply it like a bandage. Over this plaster bandage is applied to the arm and upper part of the chest, rubbing it firmly round the shoulder and axilla and again firmly round the bony points about the elbow. A proper grip of the condyles of the humerus prevents shortening of the limb; to make sure of the external rotation the forearm should

be included; if the elbow is bent till the hand is behind the head, the position is not in any way uncomfortable, and the success of the functional result is assured.

"'Two lengths of strong webbing, like horse-girths or something not quite so wide, one round the axilla and fixed on the opposite side of the table, and the other over the top of the shoulder and fixed to the bottom of the table, give an excellent resistance against which to pull. A roller towel or folded sheet will do, but being more bulky is more apt to get in the way of the surgeon's hands when manipulating the shoulder.'[1]

"The aeroplane splint devised at the former American Ambulance, Neuilly, France, is extremely good in these cases, allowing motion

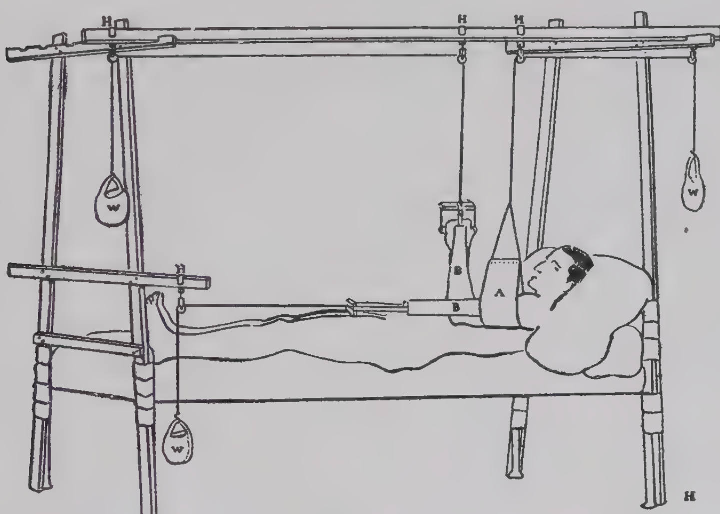

Fig. 144.—Suspension traction method of treating compound fracture of the humerus by means of the Balkan frame. *h*, Plate or hook; *w*, weights; *a*, arm suspension band; *b*, glued traction band. (*Manual of Splints and Appliances, Medical Department, U. S. A.*)

of the forearm on the arm. It is, however, bulky and does not seem necessary in the case of simple fractures.

"If the fracture is very severe with much comminution there is no better form of treatment than that of suspension in a Balkan frame. Continuous traction in abduction can be maintained by means of a Thomas arm splint or by the Blake method of suspension (Figs. 143 and 144).

"The writer when visiting the large fracture center of the French Army at Chateau Thierry was told that all fractures of the humerus were treated by a simple triangle of wood which fitted snugly in the

[1] Jones, "Injuries to Joints," Oxford War Primer, 1918.

axilla and to which a single forearm splint was fixed by a hinged piece of strap iron. Continuous extension was maintained by a bag

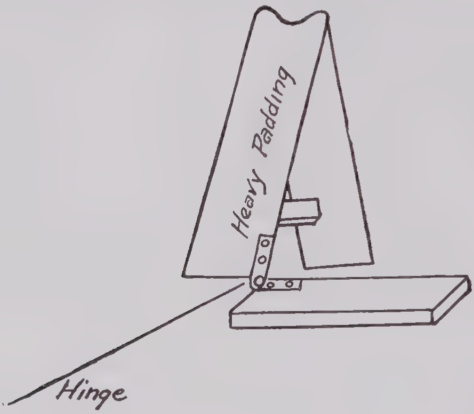

Fig. 145.—Wood triangle splint used in French army hospitals.

of sand suspended from the humerus or forearm when extension was necessary. The results with this simple apparatus were excellent (Fig. 145).

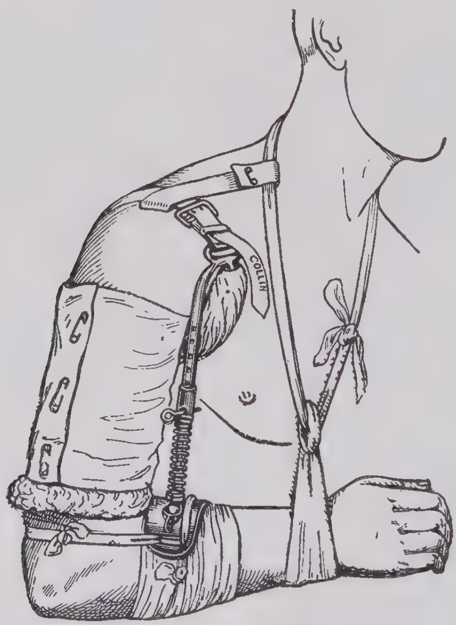

Fig. 146.—Delbet arm extension apparatus. (*Techniques des Opérations et Pansements Plaies de Guerre, Dr Dupuy de Frenelle, Aide-major-VIe armée.*)

"Among the more recent appliances is the Delbet apparatus for continuous extension. In this splint the force of extension is adjusted

by a movable pin as seen in cut. The method of application is well shown (Fig. 146).

"An excellent splint for fractures of the humerus and one adopted by the United States Army is the Jones elbow extension splint. This splint may be used for continuous extension of either the humerus or forearm (Figs. 147 and 148).

"There are two methods of applying traction to the humerus; first, by the Hennequin band, second, by glued traction bands. The Hen-

Fig. 147. Fig. 148.

Figs. 147 and 148.—Jones arm extension splint. Method of application. (*Injuries to Joints, Second Edition, Oxford War Primers.*)

nequin band is a band made of Canton flannel, fcur inches wide and eighteen inches long. It is applied over several thicknesses of non-absorbent cotton wound snugly about the lower part of the arm just above the elbow. Over this pad the band is applied from behind forward, crossed in front and pinned at the sides so that there is a direct pull along the arm.

"The glued traction bands are also made of flannel of shape similar to cut (Fig. 149).

"The glue with which these bands are applied is made as follows:
"Resin and Turpentine Glue:[1]

Resin	50
Alcohol	50
Benzine (pure)	25
Venice turpentine	5

"Powder the resin, then add half the alcohol, then the Venice turpentine and benzine, washing the measure into the bottle with the remaining alcohol. This glue may be removed with alcohol or ether. The bottle containing the glue should be kept tightly stoppered else the proportions of the constituents may change, and the glue become irritating to the skin. This glue does not require heating before use, and should not be applied too thickly.

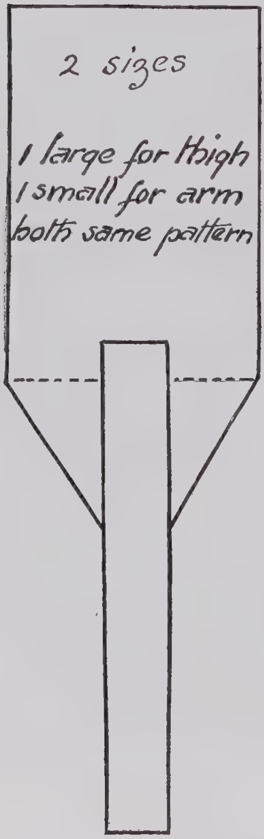

Fig. 149.—Flannel band for traction. To be applied to skin with special glue painted on with paint brush.

"Moderate traction may be safely instituted with this form of glue in from 5 to 10 minutes after application, and as much traction as is required in 20 minutes.

"Fractures About the Elbow-joint.—Jones makes the following statement which should always be remembered:

" 'There is one golden rule regarding fractures of the elbow: they should all be treated with the elbow fully flexed and the forearm supinated, with the single exception of fracture of the olecranon, which requires full extension.'

"The method of putting up an elbow in acute flexion is shown in Fig. 150.

"After a few days, four or five, it is safe to relax the acuteness of the flexion and sling the wrist of the affected arm close under the chin. The sling may be lengthened from day to day, and the patient urged to try active motion. War surgery has developed the fact that in injury to the joints active motion should be started at the earliest possible date, but this motion should be done at first under the careful supervision of the surgeon and if any stiffness or severe swelling appears as a result, acute flexion should be resumed for a few days.

[1] Formula from Manual of Splints and Appliances, Medical Department, U. S. Army.

"**Fractures of Forearm.**—Fracture of both bones of the forearm are notoriously difficult to reduce and hold in position. There appears to be nothing especially new in the treatment developed by war except in the case of compound fractures of the forearm.

"A double board splint with immobilization of the elbow by a tin right angle splint, as described by Scudder, or the moulded anterio-posterior plaster splints, described by Moorhead, are probably the best methods of holding after reduction by traction and manipulation.

Fig. 150.—Elbow put up in acute flexion. Forearm supinated and elbow in flexion. Note heavy padding on arm and forearm, as well as protective padding in inner side of arm and forearm where this comes in contact with chest.

"The French use forms of crinoline to make their molded splints. These forms consist of ten thicknesses of crinoline basted together. The forms are immersed in plaster bouillon immediately before using with vaselin. The method of making the plaster bouillon is given under the treatment of fracture of the thigh and with description of the Delbet plaster forms.

"This method of application of plaster is rapid, accurate and the form can be cut to suit the case and surgeon. After application it is held in place by a gauze bandage until the plaster sets.

"So much has been written on the reduction and retention of **Colles' fracture** that it seems unnecessary to repeat what is already known.

"There are two points which are worth bearing in mind. First, complete reduction has not been obtained until the styloid process of the radius is well below the styloid process of the ulna. Second, the tearing of the internal lateral ligament of the wrist is frequently more troublesome than the fracture of the radius.

Fig. 151.

"After reduction both anterior and posterior splints should be kept in place, except during massage, for three weeks, and the anterior splint for one week longer (Figs. 151 and 152).

"Fractures of the **carpal bones** are very troublesome and give rise to considerable disability in the wrist. It is almost impossible to appose the fragments and in order to get a useful wrist the open operation is often necessary. This is particularly true in fracture of the scaphoid.

Fig. 152.

Figs. 151 and 152.—Jones cock-up wrist splint. For use in injuries where dorsal flexion of the wrist is advisable. (*Injuries to Joints, Second Edition, Oxford War Primers.*)

"Fractures of the **metacarpals** are fairly common. Reduction is difficult but should always be attempted. It is more likely to succeed if a general anesthetic is given and the position of the fragments checked up with a fluoroscope during reduction. The reduction can usually be well held if the hand is strapped over a roller bandage, the principle being the same as that of acute flexion in the elbow. Extension by means of traction on the finger of the injured metacarpal is rarely successful and is difficult to manage.

"In industrial surgery **fractures of the fingers and thumb** are most

important and much of the worker's skill may be lost by a poor result. The greatest care should be used in setting these fractures and after reduction the result should be checked up by an x-ray picture. The wooden tongue depressor splint is clumsy and inefficient except as a first aid dressing.

"The best method of retention is probably the Marsee block tin

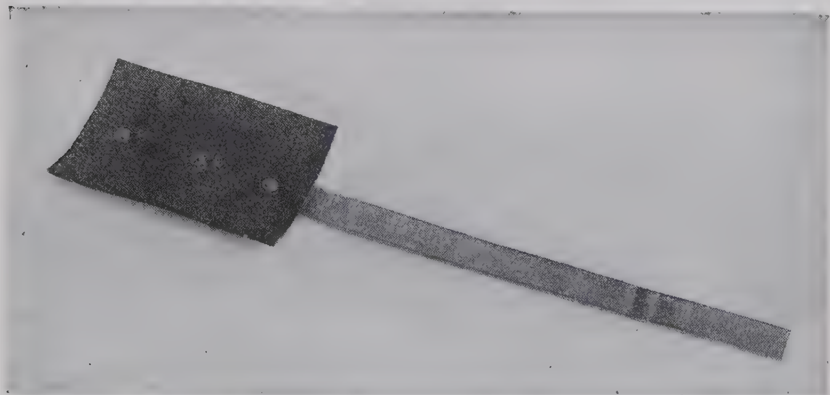

FIG. 153.—Marsee's tin finger splint.

finger splint made as follows: A strip of tin is cut 14 in. long and 2½ in. wide. This is to be folded upon itself lengthwise and hammered flat so as to make a three-ply strip ¾ in. in width. Upon one end of the strip, a piece of thin leather or canvas 4 or 5 in. long and 3 in. wide is to be riveted in order to give the strip stability when bandaged to

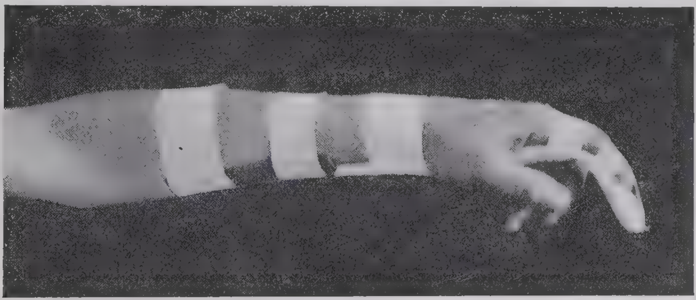

FIG. 154.—Method of application of Marsee's finger splint before bandage is applied. Note natural curve of finger.

the forearm. The strip is then shaped to suit the curved outline, in which position the fingers should be immobilized (Figs. 153 and 154).[1]

"By means of this splint anterior bowing can be overcome and saddle-shaped deformity controlled. For fractures with little displacement there is nothing better than a strong hair pin which when wound

[1] Sluss, "Emergency Surgery," Third Edition.

with adhesive plaster makes a light and easily adaptable splint. Anterior and posterior hair pin splints hold the fracture well with a minimum of bulk and weight.

"For crushes of the **terminal phalanx** no splint is required but great comfort is obtained if the Manning tin cross piece is applied over the dressing. These have been used in many factory dispensaries with universal success and no industrial surgeon should be without at least a dozen always on hand.

Fractures of the Lower Extremity

"Fractures of Femur.—Fractures of the neck of the femur are divided into impacted and non-impacted fractures. If there is firm impaction with little shortening, little need be done beyond sand bags to steady the leg and light traction by weight and pulley, or better suspension in a Balkan frame. A description of this method of handling fractures of the femur will follow.

"Whitman believes in breaking up the impaction under anesthesia and setting the leg in wide abduction with some internal rotation holding the position with a plaster cast extending from the toes to the axilla. "The limb is reduced by extension and gradual abduction to an angle of forty-five degrees, in the meantime supporting the upper end of the femur and rotating the leg inward.

"In this position, the limb is well covered with cotton batting, all the bony points especially well protected and a flannel bandage smoothly applied. A plaster spica is now applied extending from the lower ribs to and including the foot. The plaster fits the pelvis snugly and is molded close to the trochanter and posterior aspect of the joint. It is also molded to the patella and condyles, and to the foot to prevent rotation. This dressing permits the patient to rise up in bed without much discomfort.

"The advantage of abduction is that it makes the capsule tense and thus aligns the displaced fragments, that it directs the surface of the outer fragment toward that of the inner; that it relaxes the muscles that produce distortion by their traction; that it opposes the trochanter to the side of the pelvis and thus checks upward displacement. Repair in these fractures is slow and can hardly be completed within a year; thus prolonged after-treatment is necessary for restoration of function. [1]

"In cases of non-impaction three methods are open to the surgeon: first, the Whitman method as outlined above; second, suspension and traction in a Balkan frame and Thomas splint; third, open reduction and nailing the fragments in alinement. Jones has developed a frame which holds the femur in abduction, allows traction and affords an

[1] Jour. Am. Med. Assoc., February 20, 1909 (Sluss).

easy means of transport. It is of particular value in the case of compound fractures (Fig. 155).

"In war hospitals all thigh and many leg fractures are being treated by means of the Balkan frame, suspension and traction. This method, now almost unknown in civil surgery, will probably be largely used after the war. The Balkan frame consists of a head frame and a foot frame of wood united by longitudinal bars. The wood is white pine, $\frac{7}{8}$ by 2 inches. The head and foot frames consist of two uprights slightly slanted to form a truncated A. The cross bars which hold these

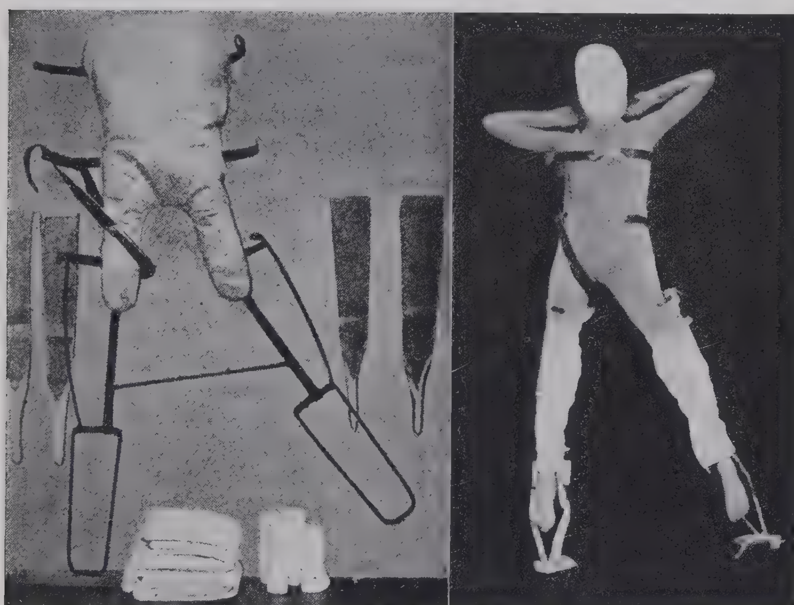

FIG. 155.—Jones abduction frame for high fractures of the femur. (*Injuries to Joints, Second Edition, Oxford War Primers.*)

uprights together are the width of the bed, at top extending beyond uprights on either side, while the lower joins the uprights at the level of the mattress.

"The longitudinal bars are two in number, resting on the upper cross bars and retained in any desired position by reciprocal notches (mortise joint).

"The exact measurements are as follows: height of side bars, head and foot frame, 6 ft. 6 in.; length of upper notched transverse bar, 3 ft. 3 in.; length of lower transverse bar, width of bed at top of mattress; length of longitudinal frame connecting bars, 8 ft. 8 in.

"The head and foot frames are set up and attached to the bed with rope; they are then joined by the two longitudinal bars which lock by their reciprocal notches in the upper cross piece of the head

and foot frames, making the whole frame firm and rigid. One of these bars can be brought out at an angle so as to produce abduction and additional cross bars of varying width can be added to the foot frame for the support of pulleys. The Thomas or Hodgen splint (Fig. 156) is suspended from three pulleys set in a block of wood 16 inches long which in turn is supported by the longitudinal bar. The set-up frame and arrangement of pulleys is well shown in the accompanying cuts from the Red Cross Splint Manual of the United States Army.

"The method of application is as follows: The frame having been set up with all bars arranged for the proper amount of abduction and the pulleys having been placed, the Hodgen or Thomas splint is pre-

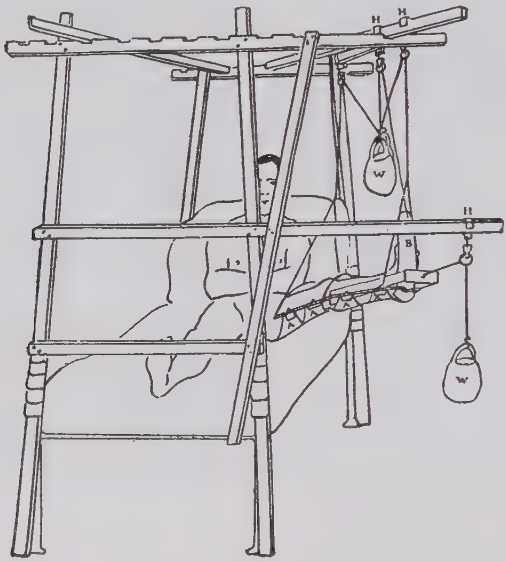

Fig. 156.—Balkan frame. Suspension method of treatment of fractured femur. Note method of obtaining abduction by additional bars on frame; to compare with figure of Hodgen splint. (*Manual of Splints and Appliances for the Medical Department of the United States Army*, 1917.)

pared as shown in the photograph. The splint is then attached by cords to the three-pulley block. Glued bands are now applied to the leg which has been previously shaved and washed with alcohol and ether. The glued bands extend a little above the site of the fracture as their pull is exerted through the skin and fascia lata before reaching the muscles and bone (Figs. 157 and 158).

"The splint is now dropped over the leg and the slings brought under the thigh and leg and fixed to the outer bar of the splint with paper clips, usually more slings are used than are shown in the cut.

The whole leg is then gently raised and the suspension weight adjusted. This should exactly equal the weight of the leg and splint. Sand or buck shot may be used in the weight bag. A second cord with about four pounds of weight passes from the upper end of the splint over a

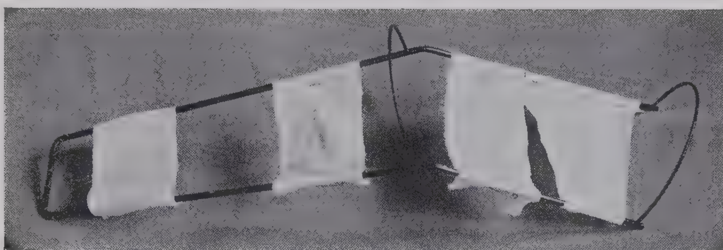

FIG. 157.—Hodgen splint.

pulley set at the opposite side of the head of the bed. This acts as a countertractor.

"The extension bands are now attached to a spreader and the proper amount of weight attached to the rope after it has passed through the

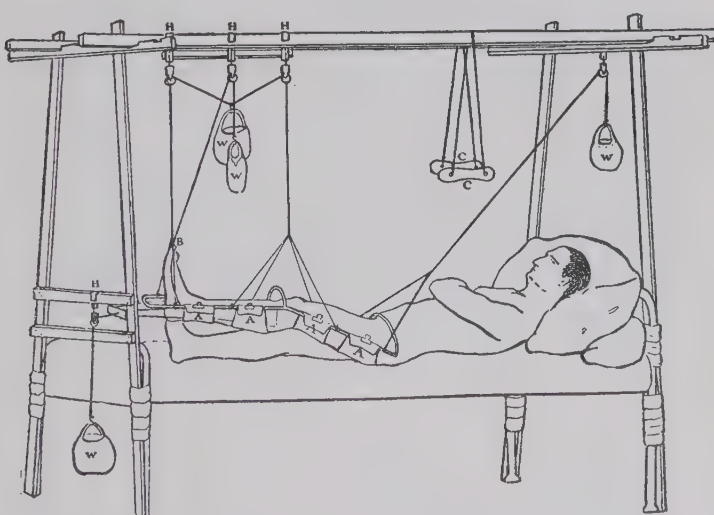

FIG. 158.—Method of suspension with Hodgen splint in Balkan frame. *a*, Slings which hold in splint, held in place by paper clips; *b*, foot piece of flannel glued to foot; *c*, hand grips so that the patient may help raise and lower himself in bed; *W*, weight; *H*, pulley hooks. (*Manual of Splints and Appliances for the Medical Department of the United States Army*, 1917.)

pulley. Last of all a flannel band is cut the shape of the sole of the foot and glued in place. The tape is tied to a piece of cord which is carried over the middle block pulley and to which a one-pound weight is

attached. This allows free movement of the ankle, exercise of the muscles of the leg and prevents foot drop (Fig. 159).

"The advantage of the suspension method of treating fractures is as follows:

"1. There is no pain.
"2. There is no edema.
"3. There is no motion of all the joints without displacement of the alignment of the fragments.
"4. The patient can move around in bed.
"5. The leg may be easily examined and massaged.

"It will be noted that this method of treatment completely upsets the time honored belief that a fracture must always be treated by a

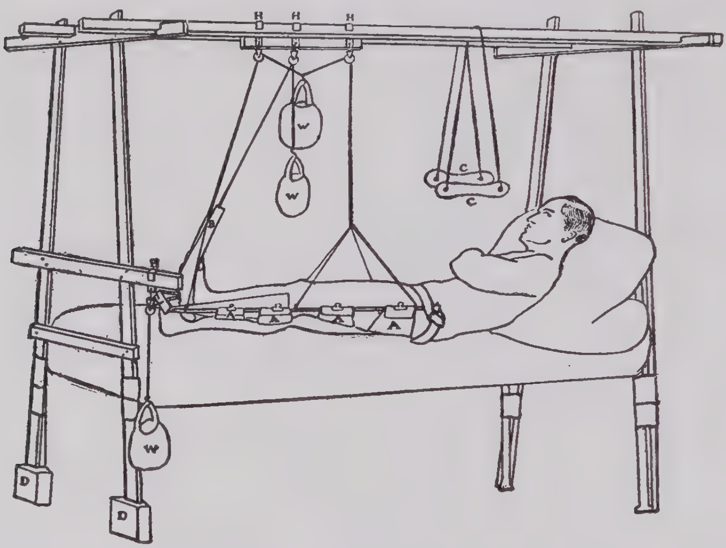

Fig. 159.—Application of Thomas splint for suspension and traction. (*Manuol of Splints and Appliances for the Medical Department of the United States Army*, 1917.)

splint which immobilizes the joints above and below the site of injury. Where considerable traction is needed, two sets of glued bands can be used, one attached to the thigh as described above, a second pair attached to the leg. To each of these traction weights are applied. When the traction is so great that it tends to pull the patient down in the bed, the foot of the bed may be elevated on blocks.

"When much traction is needed, the Steinman pin, 'ice tongs,' or the Finechette stirrup may be used. In the case of the pin much less traction weight is needed than when the glued bands are used. Blake recommends the use of the Steinman pin in all cases of fracture just above the knee joint.

"In a résumé such as this it is impossible to go into the necessary details. For a full and detailed account the reader is referred to the excellent paper by Blake in La Presse Medicale, November 19, 1917.

"Fractures of the middle of the femur can be treated in two ways: first, by the suspension and traction method just described; second, by plaster cast extending from the toes to the chest. If a plaster cast is used, proper reduction can best be secured by the use of the Hawley table or similar apparatus for producing mechanical traction. Where the Hawley table is not available, and it is considered advisable to use plaster, the following method may be used. This is the method

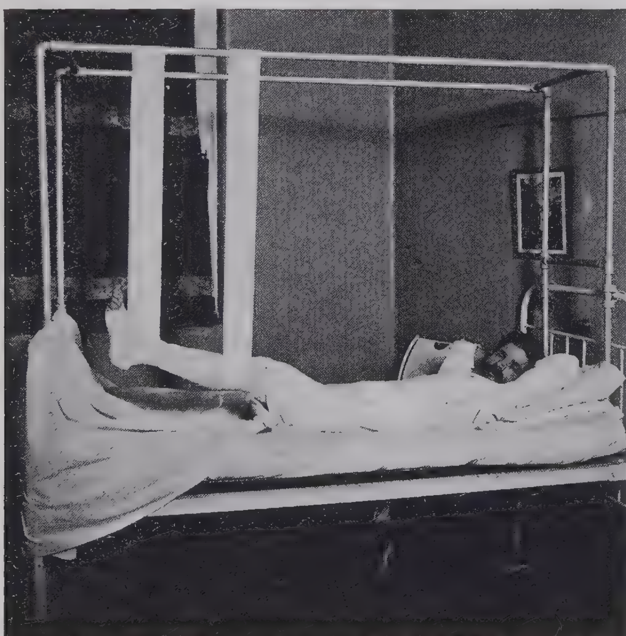

Fig. 160.—Type of fracture bed used in Colorado Fuel & Iron Co. Hospital. (*Clinic of Dr. Corwin.*)

which is now in use in a great many hospitals in France where expense prevents their having up-to-date tables and apparatus.

"The patient is supported on an ordinary table by a box under the shoulders and chest, while the pelvis is supported by a tin can or a couple of bricks under the sacrum. The affected leg is extended by means of a clove-hitch of wide bandage which is applied over several layers of cotton wound around the ankle. The ends of the muslin bandage used in making the clove-hitch are carried over a tin can or bottle, and then over the end of the table. To the bandage ends a bucket is attached which can be filled with water or sand to produce traction. Countertraction is obtained by a loop of pillow case or

sheet which passes under the crotch and is attached to a rope or to the leg of the table near the patient's head. This method is well described by Calot in his recent 'Orthopedie et Chirurgie de Guerre,' third edition. Calot describes the application of a plaster case for fracture of the femur about as follows. I have not used his words but have abbreviated to make the matter more condensed.

"Two types of plaster appliances are used. First, five plaster bandages 3 or 4 inches wide, and second, four atteles, oblong strips of crinoline, five thicknesses each, two cut long enough to extend from the toes to the hip, both in front and behind, and wide enough to slightly overlap when wrapped around the leg, one wide enough to extend from pubis to sternum and long enough to surround the abdomen, and a fourth about four inches in width and long enough to encircle the hip obliquely. The method of application is as follows: After the patient has been placed in the proper position and traction applied, the leg and abdomen are completely enveloped in one thickness of sheet wadding, stockingette or ordinary drawers, extending from the toes to the ribs. Two bandages are then dropped in cold water in a large basin holding three quarts without salt. About three minutes later three other bandages are dropped into this water. As soon as possible the first bandages are wrung out and handed to the surgeon who applies them from the toes to the hip in the usual manner. While this is being done, another basin of plaster bouillon is being prepared by an assistant. This plaster bouillon which is used very widely by the French in the use of their plaster forms of various types is made as follows:

"Three glasses of water are poured into a basin to which is added rapidly five glasses of plaster, the plaster being shaken in little by little rapidly while the left hand of the operator agitates the water to obtain an homogeneous bouillon. This should be obtained in about one minute.

"The atteles of crinoline are then plunged into the bouillon and worked through it rapidly absorbing the mixture. These are then applied to the anterior and posterior of the leg extending from the toes to the groin. Immediately following this application, another attele is applied around the pelvis and abdomen. This attele has been cut wide enough to extend from the pelvis to the base of the chest and forms a broad belt around the abdomen and pelvis. The ends overlap in the region of the groin. The fourth attele is next prepared and is applied over this. This attele consists of a band about 4 inches wide, five thicknesses of crinoline, which is long enough to completely encircle the hip and extends up over the groin. The exact method of the arrangement of these atteles appears in the accompanying cut. Immediately after having applied these atteles, the three remaining plaster bandages are applied from the toes well up to the base of the chest, completing the cast. It is well after putting on the atteles to

cover them with a thick layer of plaster bouillon taken from one of the basins in which the atteles have been prepared, and after the last plaster bandage is applied, the whole cast may be gone over with this same material. The application of such a cast requires assistants in order to achieve it quickly. Calot states that the entire application can be done in five to six minutes, or eight at the most. He advocates practice in team work between the nurses and the doctor. Immediately after the cast has been applied, it should be carefully moulded in the region of the knee, ankle and the crest of the ilium. This point is most important and has been brought out not only by Calot but by Whitman. Great care should be taken that the foot is at right angles to the leg and slightly inverted. Such a cast can be readily split if it

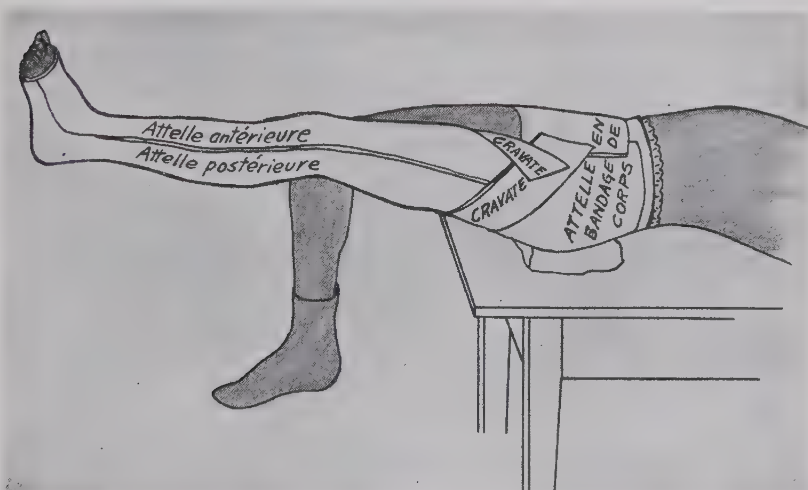

FIG. 161.—Application of cast as described by Calot and used in the French war hospitals.

appears to be too tight. If it is probable that such splitting will be necessary, a long piece of tin can be incorporated beneath the sheet wadding so that the knife will have a firm base to cut upon, and there is no danger of injuring the patient (Fig. 161).

"**Fractures of the Leg.**—Fractures of both bones of the leg can be treated either by suspension and traction, or by plaster cast. The cast in this case does not have to be as heavy as that described for the thigh fractures, but should extend from the toes well above the knee. Particular care should be taken that there is no anteriorposterior bowing. After a fracture has become consolidated, if the callous is still soft, the French are accustomed to apply a Delbet plaster appareil de marche. The French also use this method of treatment for simple fractures of the fibula and for Pott's fracture after reduction. The

patient is able to hobble around on this splint, and it apparently causes no bending or weakening of the callous. It will be seen that the weight of the leg is borne largely on the lateral and longitudinal atteles, and that the bone is still further protected by the bands around the ankle and below the knee which prevent strain upon the callous by transmitting the weight to these same lateral atteles. The atteles are

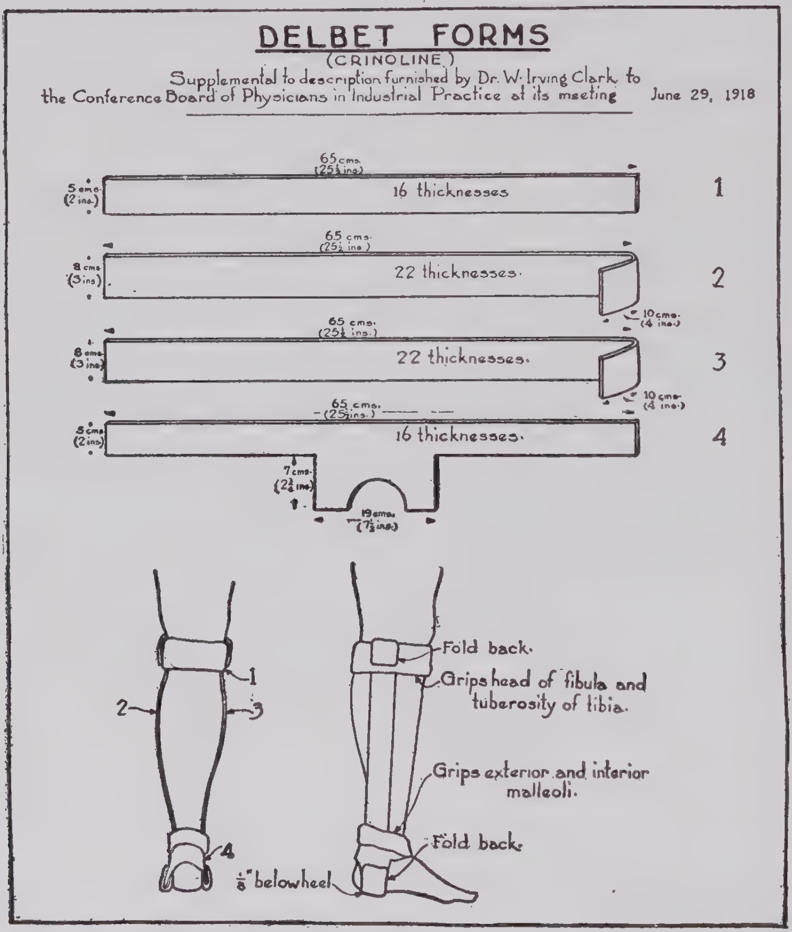

FIG. 162.—Diagrammatic description of Delbet forms. (*Dr. W. Irving Clark.*)

made of crinoline, as indicated in the cut, and are prepared by being rolled through plaster bouillon (Fig. 162).

"This plaster bouillon, which as I said before is greatly used by the French, is usually made as follows:

"The basin is filled with about a quart of cold water. To this is added plaster little by little, the plaster being shaken in while the

water is being gently agitated by the left hand of the surgeon. When the withdrawn hand appears as if it was covered with a thick white cotton glove, the proper consistency has been reached.

"The trick of preparing a proper bouillon is one which requires a little practice, but when it has been acquired the surgeon will find his ability to handle certain types of fractures greatly increased.

"Simple fractures in the region of the ankle, such as Pott's fracture, can probably be best treated by reduction in a classical manner, and a plaster cast, the foot being held in exaggerated inversion. After about a week, Delbet's appareil may be tried if the swelling is not too severe.

"The French frequently apply the Delbet even on complete fracture of both bones, making traction by means of a weight over a tin can, as described before. When reduction has been obtained the Delbet forms are applied and held in place by a Scultetus, many-tailed bandage which remains on for twenty-four hours. The traction is of course removed as soon as the plaster has set. The patient should be able to walk with the Delbet and a cane the day following the application of the splint. An important point which is sometimes neglected in the after treatment of cases of Pott's fracture is the necessity of keeping the foot in inversion, and supporting the arch with a pad, or flat-foot plate. Every case of Pott's fracture, or of fracture of the ankle, excepting the phalanges, should be supported by a firm foot pad and adhesive plaster strapping when the patient is up and around.

"**Compound Fractures.**—The treatment of compound fractures is exactly the same as that of simple fractures with the exception of the treatment of the wound. The treatment of the wound consists of the primary treatment and the secondary, or operative treatment. The primary treatment which occurs immediately after the injury should consist of painting the wound rapidly with tincture of iodin, and applying a sterile dressing consisting of many folds of gauze in the form of a thick pad, held in place by a bandage. The operative treatment is the same as is now used in the war hospitals of France. This consists of a careful dissection of all of the injured tissues, a knife being used to cut out the skin in a fine elliptical incision. Where there is some question as to whether the tissue is viable or not, no chances should be taken, but the tissue unless of great value should be removed. In short, the entire wound tract should be treated as if it were a new growth, and removed enbloc if possible.

"The following quotation from Major Poole is an exact description of the methods now being employed in the treatment of compound fractures, caused by accidents, at La Panne, and should act as a guide in the treatment of compound fractures in industrial work:

" 'These are operated upon as routine at La Panne and when it is

possible the following procedure is followed: The edges of the wound are excised, contaminated or lacerated tissues are carefully excised, the fracture is exposed and as far as possible the fragments are reduced. Foreign bodies such as plates, screws and wires are not employed except in rare cases for the reason already given under "Treatment of Compound Fractures caused by Projectiles." The wound is closed by layers without drainage.'[1]

"It is evident that the chance of infection is less in industrial work, and wherever possible the tissue should be saved and not sacrificed. With the facilities for prompt treatment, it would seem possible to convert the majority of compound fractures into simple fractures by

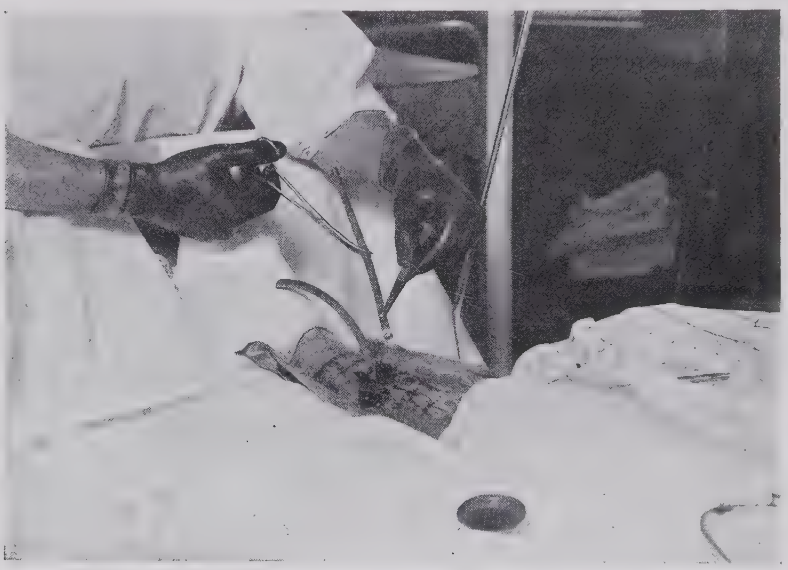

Fig. 163.—Treatment of an infected compound fracture by Carrel-Dakin irrigation method. Inserting the tubes. (*Dr. Corwin.*)

primary suture. Any loose bone which is apparently free of periosteum should be removed but care should be taken to leave in place all bits of bone to which the periosteum is adherent. In cases where there is much contamination, especially where this extends to the bone, it is better to follow the tactics of war surgery and not attempt primary suture. It should be noted here that owing to the dangers of special infection and lack of immediate treatment, the French do not dare to practice primary suture in compound fractures, except in very special cases. After the wound has been treated, the fracture should be treated by one of the methods outlined in the treatment of simple fractures. However, the use of plaster is contra-

[1] Poole, Surg. Gyn. and Obs., Sept., 1918.

indicated where one expects to have to deal with a suppurating wound, and if this condition is considered probable, the suspension method of treatment should be adopted.

"Infection in a compound fracture is a common occurrence in France, and the usual method of combating it is by the use of the Carrel-Dakin method. This has been so fully described that the technic will not be entered into here. It may be of interest to note that by the Carrel method other solutions than Dakin's are used. Those which have proved most successful in the American Red Cross Military Hospital No. 2 are appended. For further information as to the method of suspension treatment of compound fractures,

Fig. 164.—Compound fracture of leg due to industrial injury treated by Carrel-Dakin method. (*Dr. Corwin.*)

the reader is referred to Major Blake's paper in La Presse Medicale, November 19, 1917."

Dressing Solution Formulas.—American Red Cross Military Hospital No 2, Paris.

Dressing solution for fresh wounds:

1.	Quinin hydrochlorid	1
	Acetic acid (90%)	5
	NaCl	8
	H_2O	1000
2.	Acetic acid	5
	NaCl	8
	H_2O	1000

Dressing solutions for granulating wounds:

3.	B. Naphthol	1
	Sod. hydrox.	1
	H_2O	1000
4.	Daufresne's modification of Dakin's solution.	
5.	Sodium bicarb.	10
	NaCl	8
	H_2O	1000

CHAPTER XXXVIII

OPEN TREATMENT OF FRACTURES

The growing tendency among surgeons to operate upon many cases of fracture which hitherto gave good functional results by the closed method of treatment makes it seem timely to illustrate many of the bad results which occur by open treatment. The various figures represent cases collected in one of our best hospitals and the operations were performed by surgeons with the best of reputations.

Cases of recent fractures and many cases of old fractures, bony defects, bone cysts, etc., do arise, however, in which open operative treatment is surely indicated. The purpose of this chapter, therefore, is not to condemn such operations but rather to stimulate a more conservative attitude toward selecting the types of fractures so treated and the methods employed.

The bone graft has become a fixture in surgery. A great amount of experimental work on animals has been reported and has made possible the advances in this branch of surgery. However, it is only by the reporting of many and various results on humans by the rank and file of surgeons that the indications and technic of this operation will become fully established, and, above all, that the autogenous bone graft will become recognized as the safest and surest method of repairing certain bony defects—far superior, in most cases, to any foreign material which can be used, such as Lane's plates, silver wire, nails, ivory pegs, magnesium plates or tubes, aluminum plates, and even the heterogeneous bone plates, screws and bone chips.

Many discussions and controversies have arisen during the last few years in this field of surgery, a history of which would make an interesting paper in itself. Three questions especially have formed the nucleus of this discussion, namely:

1. The comparative value of bone grafts and Lane's plates, and other foreign materials in the open repair of fractures, and in the repair of certain bony defects.

2. The indications for the open treatment of fractures.

3. Does the bone graft have osteogenetic power, and if so, does the periosteum alone possess this power, or does the graft simply form a bridge between the ends of the bone to be repaired, over which regeneration by conduction occurs?

Lane plates, ox-bone plates, silver wire and many other foreign materials have been chiefly used in the past, and even by many of our best surgeons to-day, for the open treatment of fractures. Good results have obtained in many cases, but, unfortunately, many others

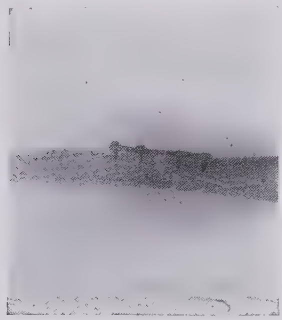

Fig. 165.

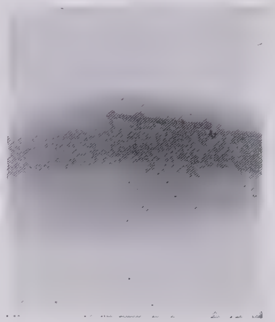

Fig. 166.

Fig. 165.—Lane plate applied to recent fracture.
Fig. 166.—Three weeks later—plate loosening due to liquefaction.

have been very discouraging. These bad results can be summarized as follows:

1. Delayed union: The presence of the foreign body causing a deficient callous formation and may even cause some liquefaction and absorption of the healthy bone to which the plate is attached.

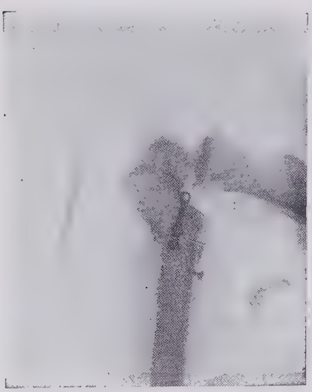

Fig. 167.

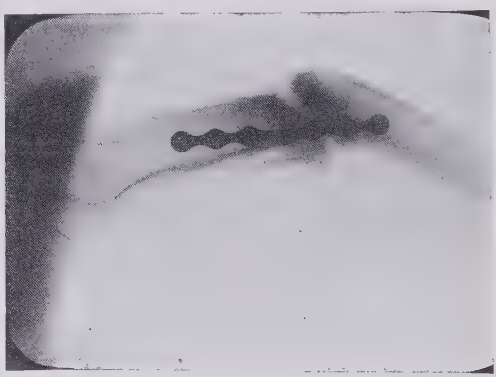

Fig. 168.

Fig. 167.—Ends of fragments absorbed allowing plate to become detached with displacement of lower fragment.
Fig. 168.—Sclerosis of ends of fragments prevented union.

2. The wound is more prone to infection because of the foreign body. When infection does occur, the above mentioned necrosis of the healthy bone is the rule.

3. Non-union may occur:

(a) Due to liquefaction, the plate may loosen and not hold the fragments in firm apposition (Figs. 165 and 166).

(*b*) Due to infection or the presence of foreign body, the ends of the fragments may absorb and not have coaptation (Fig. 167).

(*c*) In old un-united fractures, the ends of the fragments of bone may have undergone sclerosis. It is the rule to freshen these ends, but the sclerotic process may extend farther than the surgeon expects. Thus a plate attached to these fragments will give fixation, but no union occurs (Fig. 168).

4. Subsequent operations are often necessary:

(*a*) For the purpose of replacing a loosened screw or readjusting a plate which has slipped.

(*b*) For the removal, later on, of the foreign material because it has become a source of irritation.

(*c*) To resort to some other plan of operation, because of non-union.

As a substitute for this foreign material method, which has all of the above dire results to its credit, we have the autogenous bone graft, which, in the hands of most operators accustomed to its use, has given practically 100 per cent. good results in the repair of fractures and other bony defects. From both a practical and a scientific standpoint, living bone grafts are more logical, chiefly for these reasons:

1. There is no foreign body present which later may have to be removed or may cause some of the above described complications.

2. Infection does not destroy the graft, as was at first supposed; in fact, I have seen the growth of a graft apparently stimulated in the presence of infection.

3. Union is more rapid than where ox-bone plates or Lane plates, or other foreign material has been used.

4. Non-union in the old un-united fractures, because of sclerosis of the ends of the fragments, need never occur, especially if Albee's inlay method of bone grafting is used, as the transplant always extends a sufficient distance above and below the ends of the fragments to reach into healthy bone. For this reason, the intramedullary graft is not always adaptable to these cases, as the sclerotic process may extend a considerable distance into the medullary canal.

5. A living bone graft will conform itself to the shape and function of the bone into which it is grafted (Wolff's law).

The next question, "The indications for the open treatment of fractures," likewise forms the nucleus for a very lengthy discussion.

McAusland, in Surg. Gyn. and Obs., September, 1914, advocates the open method on most fractures, in order to secure perfect alignment and coaptation. He thinks there is less danger to the soft parts by this procedure than by so much manipulation.

In opposition to this doctrine, B. S. Campiche,[1] writes a plea against unnecessary operations for fractures which is very timely.

So many articles have appeared in the last few years, and so many clinical cases have been demonstrated on the open treatment of fractures, that the student and the profession at large are almost led to believe that with some of the very best surgeons this is really the treatment of choice for the majority of fractures. We know, however, that during the last century the treatment of fractures by the closed method has been satisfactory in most cases. Especially in the last decade this conservative treatment has been so vastly improved, due to the aid of the x-ray, that bad results are comparatively few.

In every case of recent fracture, therefore, conservative non-operative treatment should be tried thoroughly and conscientiously, and the operative treatment reserved for those few cases—not over 3 per cent. where the closed method has failed.

The only indications for open treatment in recent fractures are:

1. Interposed soft tissues which prevent coaptation of the fractured ends.

2. Two or more fractures of a long bone, where it is impossible to secure coaptation and fixation of each fragment.

3. Certain fractures of both bones of forearms or leg, where, by every known manipulation, it is impossible to secure coaptation and fixation of both fractures at the same time.

4. Certain fractures into joints, where loose fragments will interfere with the function of the joint.

5. A few atypical fractures, where muscular action has displaced a fragment to such an extent that coaptation and resulting function can only be secured by operation.

In recent fractures, the application of internal splints is not always necessary as the ends may be held in apposition by chromic gut, or kangaroo gut, or even by external splints after coaptation has once been established. However, in many recent fractures, where operation is necessary, a bone graft of the inlay type, made from the longer fragment, will give the surest fixation and the quickest results.

In old fractures, the chief indications for open treatment are:

1. Non-union.

2. Faulty union with very marked deformity or loss of function.

3. To restore or supplant dislodged or destroyed fragments.

It is in these last conditions that the bone graft is of the greatest value and far superior to any foreign material.

The third question regarding bone grafts concerns the viability or non-viability of the graft. Murphy, Barth, et al., claim that the graft

[1] Jour. Am. Med. Assoc., Vol. lxiv, No. 20.

is not osteogenetic. They contend that osteoblasts form from either end of the sectioned bone and circulate through the Haversian canals of the transplant, and that as they multiply, they cause absorption of the bone cells of the transplant, the latter acting only as a scaffold or osteoconductor—a process of substitution.

Axhausen and others claim that the inner layer of the periosteum is the only portion of the transplant that has osteogenetic powers, and that the bone in the graft dies. MacEwen, of Glasgow, states that the periosteum has no such power, but is simply a limiting membrane for the osteoblasts, regenerating from the osteoblasts of the graft itself, and that this membrane prevents the spread of these osteoblasts into the surrounding tissue.

Many of our more recent investigators, Albee, Johnson, Phemister Lewis, et al., claim that the graft has osteogenetic powers in all three of its layers—periosteum, cortex and endosteum—but more pronounced in the periosteum and endosteum, and especially more marked at either end of the graft, because here the new blood supply to the graft is the richest. In fact, the osteogenetic power of any of these layers depends absolutely on the blood supply. A portion of the graft near the center, and especially in the denser cortex, becomes necrotic and absorbs and is replaced by the osteoblasts from the living portion of the transplant—the process of "Creeping Substitution" of the old bone by the new.

From studying the *x*-ray findings in a large number of cases I feel that we have conclusive proof of:

1. The osteogenetic ability of the periosteum.
2. The osteogenetic powers of all three layers of the graft.
3. The death of a certain portion of the graft and the substitution of osteoblasts from other portions.
4. And that the transplant is not simply a scaffold.

Autogenous bone grafts have become of paramount value also in repairing many bony defects, such as those resulting from complete loss of bone due to:

1. Destructive infections, septic, tuberculosis, lues, etc.
2. Defects of development.
3. Benign tumors, as bone cysts, myeloma, etc.
4. Encapsulated malignant tumors, as giant-cell sarcoma and chondrosarcoma.

These conditions are extremely important in industrial surgery as fractures from very slight injuries sometimes occur due to the presence of these pathologic conditions. I have had two cases of fracture and one case of alleged injury to the finger in which the accident was really coincidental, the real cause being the presence of a bone cyst in each case.

Bone cysts are the small, single or multiple cysts found in the body of the bone and usually destroy most of the cortex, the periosteum often serving as the cyst wall. They are the end-result of a low-grade

Fig. 169.—Multiple bone cysts, osteitis fibrosa, of hands discovered in an applicant for work. Under present compensation laws the employer could be held responsible for subsequent fractures.

inflammatory affection of the bone and medullary tissues, known as osteitis fibrosa.

Fig. 170.

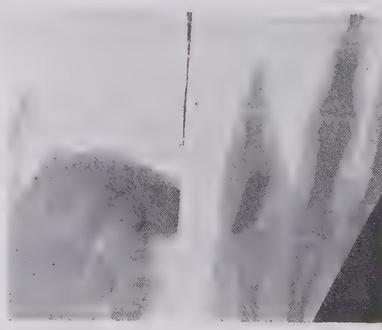

Fig. 171.

Fig. 170.—Bone cyst in little finger. This girl employee claimed her work was responsible for the condition.

Fig. 171.—Same as Fig. 170. Three days after bone from tibia was transplanted. Cortex only was transplanted. Fragments of periosteum from wall of cyst were left intact and growth first took place in these and in ends of transplant.

Osteitis fibrosa causes a destruction of the bone, and this is gradually replaced by granulation tissue, which, in time is converted into connective tissue, with or without the formation of these bone

cysts. Any of the long bones may be affected by this condition, especially the upper end of the humerus; also, the small bones of the foot and hand are often involved. The bone, if a cyst is present, increases in size very slowly, as compared to a bone affected by

Fig. 172.

Fig. 173.

Fig. 172.—Same as Fig. 170, eight months after operation. Note that transplant now has the normal contour of metacarpal bone. (*Wolff's Law.*)

Fig. 173.—A bone cyst of upper end of humerus. A fracture followed a slight collision between trucks.

malignant disease, and often a fracture through the cyst is the first evidence of the disease.

In small cysts, where the cortex of the bone is not completely destroyed, simply opening and thoroughly curetting will often cure

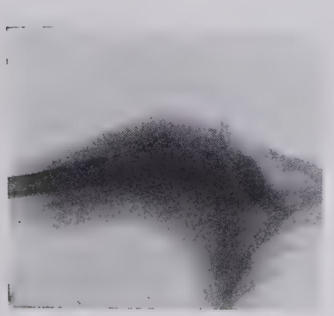

Fig. 174.

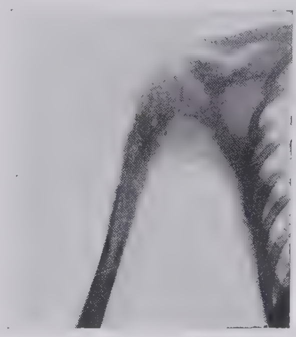

Fig. 175.

Fig. 174.—Same as Fig. 173, three weeks after bone transplant; arm at right angles held by plaster cast. *X*-ray shows growth taking place from periosteum, chips of bone inserted about transplant and in the ends of the transplant.

Fig. 175.—Same as Fig. 173, six months after operation. Note how transplant has assumed the natural contour of the humerus.

the condition, but in multiple cysts, where the shaft of the bone is completely destroyed for a distance, the periosteum should be stripped off and the entire cyst excised; then the resulting bony defect should be

repaired by the insertion of a bone graft taken, preferably, from the patient's own body.

In repairing fractures or these bony defects by the autogenous graft, the technic of the operation is practically the same. I will pass over the actual steps of these operations, but here are a few facts which should be emphasized:

1. The bone work is best done with a motor and the various shaped saws, as outlined by Albee, Hogrin, et al., especially the twin saws for inlay work; a chisel and mallet may be used, however.

2. The greatest asepsis must be observed. Some advocate the extreme methods of never touching the graft except with instruments.

Fig. 176.

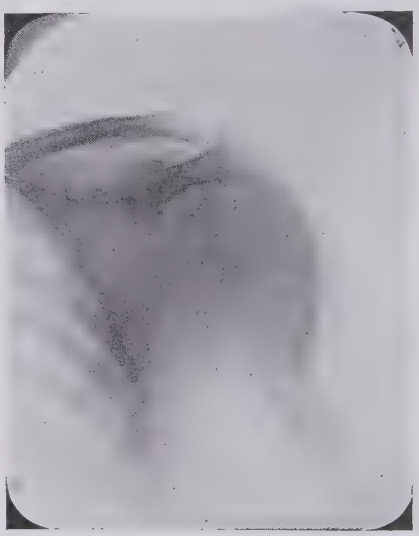

Fig. 177.

Fig. 176.—Same as Fig. 173. Eight months after operation patient had practically normal motion in shoulder joint.

Fig. 177.—Large bone cyst of humerus. (*Clinic of Dr. A. I. Halstead.*)

The graft should not be placed in normal salt solution, as this washes away the blood on the graft which nourishes its cells.

3. The smaller the graft, the better its growth. When necessary to use a large graft, save every small fragment of bone and pack about the graft, as these become centers of osteogenesis.

4. Transplant all three layers and coapt periosteum to periosteum, cortex to cortex, and endosteum to endosteum. This is not essential for growth of the graft, but gives better blood supply and quicker growth. It is a far superior method to the intramedullary grafts.

5. Attach the soft tissues singly about the graft and suture muscle attachments to the graft as near their normal position as possible.

6. As early as possible, allow slight movement in the part, so that

the graft will not only grow, but will conform itself to meet its new mechanical functions (Wolff's law). The x-ray should be the guide as

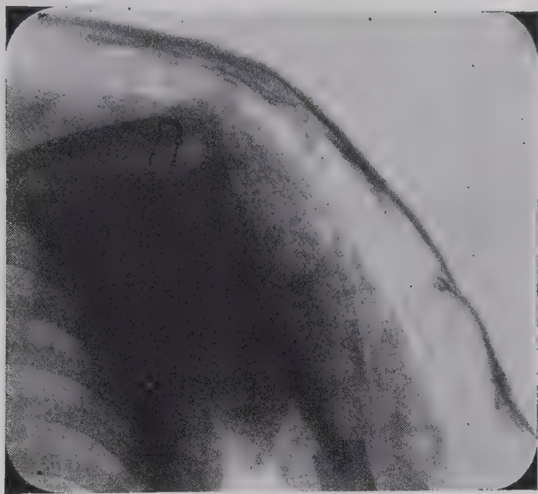

FIG. 178.—Same as Fig. 177, two weeks after transplant was made. (*Operation by Dr. A. I. Halstead, St. Lukes Hospital, Chicago.*)

to when to allow this motion, and it should not be done until the graft has become firmly fixed.

FIG. 179.—Same as Fig. 177, eight months after operation. Patient is developing good function. Illustrates process of "creeping substitution."

7. It is preferable not to transplant in the presence of infections, but, contrary to earlier teachings, experience has taught us that in-

fection, even when great amounts of pus are present, does not, as a rule destroy the graft. Thus, in compound fractures, much time can be gained, instead of waiting until the wound is perfectly healed.

8. No foreign material, such as silver wire or ivory pegs, should be used to hold the graft in place. Kangaroo gut is my choice of material for this purpose.

Figures 165 to 179 illustrate the various points brought out in this chapter.

CHAPTER XXXIX

AMPUTATIONS

Amputations the result of injuries occurring in industry have decreased materially during the last ten years but they are still sufficiently prevalent as to make this one of the most important problems confronting the industrial surgeon. Their decrease has been due chiefly to:

1. More prompt attention by the surgeon.
2. Preventive measures reducing the number of infections.
3. A more conservative attitude on the part of surgeons toward seriously injured extremities.
4. The "safety first" movement which has materially reduced the number of serious accidents in hundreds of our largest industries.

In a large steel mill prior to the employment of a surgeon constantly on the job and before the introduction of accident preventive measures, amputations were very common. The commonest cause of these amputations was severe crushing wounds followed by infection. After a surgeon was employed, prompt emergency treatment was rendered to all of these cases with the result that the number of infections decreased rapidly. This surgeon claimed that the reduction was due chiefly to the use of tincture of iodin which was immediately applied to wounds no matter how extensive the injured area. This concern was one of the first to adopt the measures advocated by the National Safety Council and immediately these serious accidents became less frequent. This is the history of hundreds of other industries.

The cost of installing these accident prevention measures, plus the cost of employing the best surgical talent to render proper and immediate surgical care to injured employees is far below the cost of paying indemnities for permanent disabilities especially when involving the loss of members. For a decade this doctrine has received nation wide publicity but still there are industries so short-sighted as to refuse to adopt such a straightforward business proposition. Neither the economic nor the humanitarian viewpoint seems to appeal to them. It is high time that both the States and Federal governments awake to their responsibilities and legislate most drastically with a view to preventing loss of members and loss of life from industrial accidents.

In civil practice surgeons have become far more conservative with regard to amputating injured members than they were previously.

This is undoubtedly due to the fact that our present day methods of combating infections are superior to the old methods; the transplantation of skin, fascia and bone has enabled the repair of wounds which formerly were considered hopeless; and there has been a growing tendency to delay amputation to some subsequent date, trying the reparative work first and later amputating if this failed. The severe infections, especially from the gas bacillus, following war injury has necessitated the more radical operations on the part of the army surgeon. Many wounds occurring on the battlefield have made amputations necessary which if received in industry would have yielded to conservative treatment. The opportunity of giving more prompt attention to the wounds and the absence of these extremely virulent infections make the latter course possible. Medical officers returning to the accident surgery of civil life must constantly bear these facts in mind.

Through the courtesy of Dr. Royal Meeker, Commissioner of Labor Statistics, United States Department of Labor, the author was able to obtain the most recent figures concerning industrial accidents in the United States for the year 1917. Of the 875,000 non-fatal industrial accidents causing disability of over four weeks, 68,820 resulted in amputations of some member of the body. These were distributed as follows:

Loss of one finger or part of finger	52,050
Loss of two or more fingers	9,100
Loss of one hand or arm	2,880
Loss of one foot or leg	1,220
All other specific losses (including multiple)	3,580
Total	68,830

When we consider the thousands and thousands of amputations which result yearly from accidents received on the streets, on the farms and in the homes which are not included in the above figures, we obtain some conception of the size of this problem. The estimated number of amputated cases for all the nations participating in the present war is thought to be between 400,000 and 500,000, approximately 100,000 a year. The number of amputated cases from industrial accidents in the United States during one year closely approaches the yearly rate from this terrible war.

It is evident, therefore, that the treatment of injuries necessitating amputations is one of the most important problems in industrial surgery. Every country participating in the present war has made an intensive study of this problem in all its aspects with a view of obtaining the very best economic end-results for the soldiers thusly disabled. As a result of these studies, many valuable principles applicable to

industrial surgery have been conceived. If the surgeon in civil practice will take full advantage of these great principles the unfortunate patient in the future who loses a limb should have many more opportunities for a happy existence than has been afforded to these individuals in the past.

Finger Amputations.—In industry, the majority of finger amputations result from crushing wounds in machinery; from saws, heavy shears, presses, etc., cleanly severing the finger from the hand; from lacerations, nail wounds, splinters, scratches and abrasions which, through neglect, become seriously infected. Statistics obtained from several accident insurance companies and from a number of industrial surgeons showed a surprisingly high percentage of amputated fingers resulted from infections of minor wounds. In order to eradicate the great loss of fingers from industrial accidents two things are necessary:

1. Proper protection against these machinery accidents;

2. Immediate antisepsis and proper emergency treatment of all finger accidents with a view of preventing these infections.

Formerly I followed the usual procedure in amputating these injured fingers, namely, removing a sufficient portion of the bone to enable the formation of an anterior and posterior skin flap which could be approximated and sutured. This practically always resulted in a loss of a greater portion of the finger than actually occurred at the time of the accident. Like most surgeons, it was felt that quicker healing and a more sightly result could be obtained by such reparative work.

The great majority of finger injuries requiring amputation which report to the surgeon are of the following types:

1. The tip of the finger crushed off with loss of only a slight portion of the bone.

2. Most of the distal phalanx removed with a small portion of the bone exposed and the soft tissues lacerated for a short distance above the point of severance.

3. The distal phalanx and the lower third of the middle phalanx crushed off leaving the bone splintered and exposed and the soft tissues lacerated.

4. Complete loss of the finger often including the end of the metacarpal bone and the soft tissues about the lower portion of the palm lacerated.

One or more of the fingers may be thusly injured. For the last five years I have treated such finger injuries as follows:

1. Immediately paint the wound with tincture of iodin.

2. With sterile gauze make gentle but firm pressure upon the injured part until the bleeding ceases. When necessary, a bleeding artery is grasped with forceps and ligated.

3. If the bone is splintered and protrudes below the soft tissues,

it is snipped off even with the rest of the wound by means of a bone forceps. If it does not protrude it is left entirely alone.

4. Loose shreds of tissue deprived of sufficient circulation are removed. No other effort is made, however, to trim up the soft parts.

5. Narrow strips of adhesive plaster one-eighth to one-fourth of an inch in width are now applied over the wound directly on the skin. These adhesive strips extend up the finger from one inch to two inches above the wound. They are first applied on the flexor surface, pulled down snugly over the wound and then back over the extensor surface. They should not overlap but a small space should be left between each strip to allow for oozing and drainage. One or two strips should next be applied over the wound from side to side. The portion of the adhesive plaster which comes in contact with the wound can be sterilized by painting it with tincture of iodin before applying it. After the strips are in place, they should be lightly painted with tincture of iodin. Next a sterile gauze dressing is applied and the injured member bandaged.

6. This dressing should be changed daily but the strips need not be removed for at least four days unless infection makes it necessary which is rare. Adhesive strips should be reapplied every four to six days.

By this method no more of the finger is lost than actually occurs at the time of the accident. The adhesive strips prevent retraction of the soft tissues from the bone, pull the skin edges inward, form a bridge for the new granulations, and finally cause a complete approximation of the soft tissues over the end of the bone with excellent closure of the wound. The advantages of this line of treatment are:

(1) A greater portion of the member is saved; (2) it can be carried out without an anesthetic and the necessary operative work required by making flaps and suturing; (3) better drainage is afforded in case of infection; (4) the patient is more pleased because at each subsequent dressing he can see that the maximum saving of tissue is being attained. The only disadvantage is that in clean cases the length of treatment is usually prolonged over the period required for healing when the skin is immediately approximated by the flap method.

The manager of one of the departments once reported to the doctor's office complaining of a slight pain in his abdomen. One of the surgeons placed him upon a new operating table in order to examine the abdomen. This table was a new-fangled contraption which could be made into a chair. After the examination, as the patient was arising from the table, the footpiece fell forward. The manager's right index finger was caught in the hinge in some way and the tip completely cut off at the middle of the distal phalanx. Naturally

the manager was very outspoken in his criticisms of such an office and the surgeon was extremely chagrined. I was immediately called and endeavored to explain that the table was new and the accident was not the fault of the doctor (this case afforded the example that "safety first" methods must be applied in the doctor's office and in the hospitals). I explained to the manager that we could remove the remaining portion of the bone back to the joint, coapt the flaps and secure a good result with only the loss of his distal phalanx; or by prolonging the treatment somewhat we could treat it by the adhesive strip method and most of the finger would grow back into place even including a portion of the nail. The latter plan was adopted and in six weeks the wound had healed. At the time of the accident careful measurements of both index fingers were made and the right one was just a half inch shorter than the left. Three months after the accident comparison of the two fingers showed only one-fourth of an inch difference in length. The injured finger had a natural tapering and a well-formed nail which required close inspection to show that it was somewhat shorter than the other nail. The excellent result obtained removed all criticism concerning the accident.

The removal of bone and soft tissue in order to attain well-formed flaps which can be sutured over the end of the severed finger is wasteful surgery—not only wasteful to the employee but necessitating greater compensation on the part of the employer for the loss of the member.

This adhesive plaster treatment is also applicable to many cases suffering loss of a portion of the palm or a portion of the foot. I have also used it to approximate the flaps in amputations of the leg and arm where haste in operating is indicated.

Amputations of Upper Extremity.—The emergency treatment consists in antisepticizing the wound with tincture of iodin and combating hemorrhage and shock. The subsequent indications are: (1) to secure the safety of the patient, and (2) to secure the best functional result. The best functional result will depend upon the amount of the member saved, the location of the scar and especially the absence of a painful scar, and the adaptability of the stump to the artificial limb which must be worn.

When infection is present the safety of the patient can best be conserved by establishing good drainage without endeavoring to form and approximate flaps. The Interallied Surgical Congress has requested that amputation for infection should be flapless or with short flaps held apart. When it is necessary to leave the incision open traction should be applied to the skin just as soon as possible in order to overcome retraction (see Fig. 180) and thus limit the size of the resulting scar. After the infection has subsided a reamputation, in order to secure a proper closure, may be necessary but quite frequently

approximation can be secured by the adhesive plaster method outlined above especially in the smaller extremities.

The location of the scar in arm amputations should either be posterior or preferably across the end of the stump as in using the stump pressure is usually exerted laterally and not on the end. A wrist stump, however, requires frequent end pressure and for this reason a long palmar flap with the scar at the back of the wrist is preferable. In all other locations the short anteroposterior flaps will be found the most useful. Whenever possible the muscles and deep fascia should be sutured over the end of the bones in order to prevent an adherent scar and to give sufficient bulk to form a cushion.

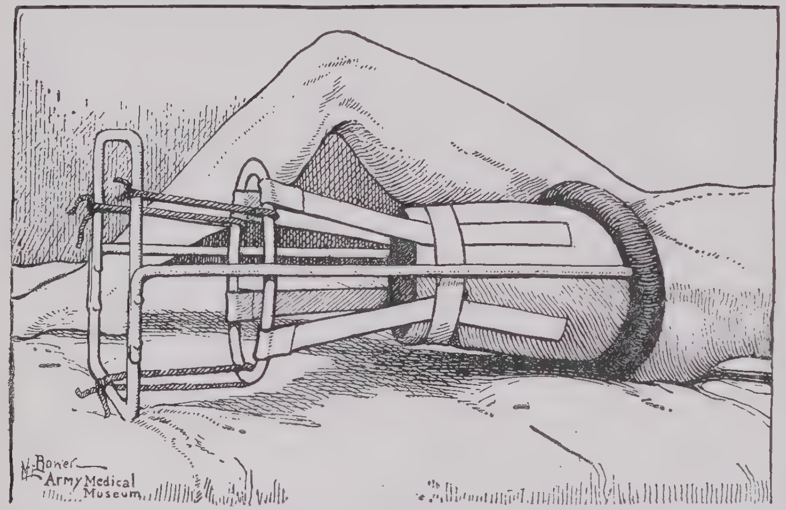

Fig. 180.—Traction applied to skin to prevent retraction. Stump extension with a modified Thomas splint. (Adapted from Sinclair.) "A Thomas knee splint is cut down and a 9-inch square riveted on to the side bars 12 inches beyond the end of stump. An 8-inch circle of aluminum is attached by gauze and glue to the skin of the stump so as to be 6 inches distal to the cut surface. Extension is made from the ring to the square either by tapes or rubber bands. The square acts as a pedestal and also for the attachment of the extensions." (*Courtesy, "The Military Surgeon."*)

Redundancy of tissue affording excessive motion is to be avoided as in this case the skin may become irritated from rubbing against the socket of the artificial appliance. In amputations of the forearm soft tissues must be carefully sutured between the ends of the ulna and radius to prevent union between these bones as such union interferes with pronation and supination.

The Division of Military Orthopedic Surgery of the Office of the Surgeon General of the United States Army has made an extensive study of the preferable sites of amputation as related to the future requirements of the artificial appliance. These favorable sites are graphically shown in Fig. 181.

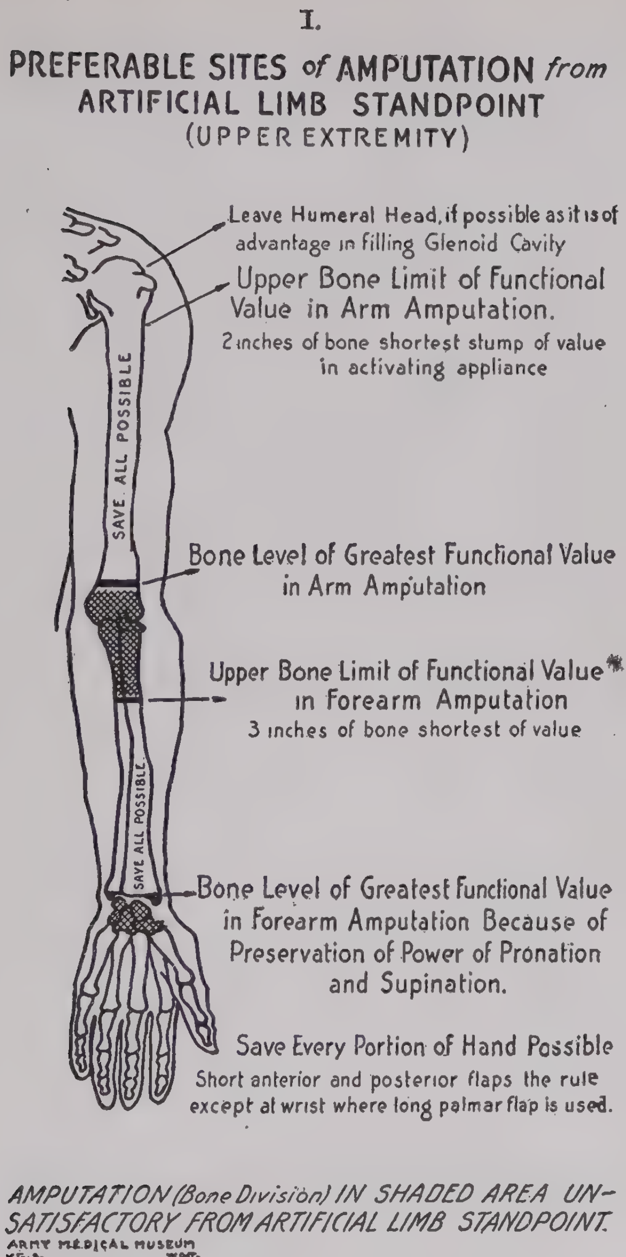

Fig. 181.—Courtesy, "*The Military Surgeon.*"

In a report from the Orthopedic Division published in the Military Surgeon for February, 1918, the following statements regarding the site for amputations in the upper extremity are made:

"'In the hand it is generally recognized that the importance of preserving as much as possible of the thumb and fingers need hardly be emphasized. A thumb, or part of a thumb, together with some portion of fingers or hand to which it can be opposed, is more useful than any artificial contrivance which can be fitted. In this region irregular operations—trimming, removal of splinters of bone or sequestra, etc., are likely to give better functiomal results than any set amputation.'

"At the wrist there is a decided advantage in disarticulation on account of the better preservation of the forces of pronation and supination, which are now being used to activate the artificial hand. Moreover, in this case it is easy to put the necessary mechanism below the wrist. A further advantage in amputation at this point is that the enlargement of the wrist is a decided aid in holding the artificial arm in position.

"In the forearm, amputation in the lower part of the middle third gives a good and useful stump. While the circulation of stumps in the lower third is often poor, yet the better preservation of the power of pronation and supination that is secured by amputating as near the wrist as possible makes this site desirable; to ensure freedom of these movements every precaution should be taken at the time of operation to guard against union of the ends of the bones by osseous or fibrous adhesions. Above the middle of the forearm it becomes of increasing importance, the nearer the elbow is approached, to save every fraction of an inch possible. When the stump is less than three inches, great difficulty is experienced in preventing it from slipping out of the socket, owing particularly to the action of the biceps tendon during flexion of the elbow, and with the short stump there is also naturally a decided loss in leverage. 'If it is impossible to get a forearm stump extending at least an inch and a half below the insertion of the tendon of the biceps, amputation above the condyles of the humerus is to be preferred.'

"In the upper arm the lowest point at which amputation is desirable is just above the condyles (about two inches above the center of the joint); the reasons for this are similar to those already discussed. From this point the longer the stump the better. Above the middle of the upper arm the surgeon must utilize every surgical expedient to save all the length possible; the power to control an artificial arm diminishes to an alarming degree with each loss of even a slight portion of bone. But little can be expected from a stump in which the bone extends less than two inches below the axillary fold. Since a terminal and even an

adherent scar is not particularly objectionable in the upper extremity, owing to the pressure being exerted laterally, skin-grafting (usually inadvisable in a leg stump) may be employed to cover defects rather than a reamputation performed. Moreover, in some cases, 'a good deal can be gained by removing wholly or in part the folds of the axilla, that is, the pectoralis major and the teres minor. This has been done with good results and seems to be an operation worth doing in suitable cases.' It is always advisable to retain any portion of the upper end of the humerus, even if only the head, rather than to remove it (as is necessary under similar conditions in the thigh), since the appliance is fitted much more easily when the glenoid cavity is filled."

Amputations of the Lower Extremity.—The emergency treatment and the same general indications described for the upper extremity are also applicable to amputations performed on the lower extremity. Fig. 180 shows the method of extension which can be applied to the lower limb when infection necessitates the "guillotine" or flapless amputation.

The location of the scar and the condition of the tissue at the end of the stump are of prime importance as end-bearing stumps are becoming more and more popular. Practically all artificial legs are designed by the makers with a view of carrying the weight either on the ischial tuberosity or on the tuberosities of the tibia. H. H. M. Llyle,[1] has pointed out the importance of end-bearing stumps in a large proportion of cases. The importance of such stumps has been further demonstrated by E. M. Little[2] reporting on the amputated cases at Roehampton.

Dr. David Silver advocates the closest co-operation between the surgeon and the artificial limb maker in order to increase the number of end-bearing stumps; "for it is obvious that the transference of even a part of the weight to the end of the stump will conduce to greater comfort and improve function."

With this in mind the placement of the scar is exceedingly important. Tuffier says: "In the leg, amputation by circular incision results in terminal cicatrices which have every defect of situation, shape and adherence; on this point all surgeons are agreed." Therefore, leg flaps should be made of unequal length thus forming the scar along the lateral and preferably the posterior surfaces. Here again the muscles and fascia should be carefully sutured over the end of the bone in order to secure a sufficient pad of soft tissue. Llyle very aptly states that "the best formed stump, if not quickly put to use as a real support, may become atrophied and useless."

[1] Jour. Am. Med. Assoc., Vol. xviii,1914.
[2] Brit. Med. Jour., Oct. 27, 1917.

The preferable sites of amputation in the lower extremity are shown in Fig. 182. This chart was also prepared by the Division of Orthopedic Surgery of the Surgeon General's Office and is explained by them as follows:

"In the foot it is undesirable to save a solitary toe, even the greatest toe. Amputation just back of the heads of the metatarsal bones, in front of the attachment of the tibiales and peronei, may be fitted so as to give a useful foot; but amputation through the tarsus, back of the muscular attachment just mentioned, is usually unsatisfactory, as sooner or later a condition of equinus is likely to result due to contraction of the unopposed calf muscles and walking becomes difficult or impossible.

"At the ankle a satisfactory end-bearing stump is usually secured by Syme's amputation, in which the bones are divided just above the joint line and at right angles to the long axis of the tibia. The Syme is preferable to the Pirogoff, as it gives more room for an ankle joint mechanism and avoids the difficulty frequently encountered in keeping the end of the os calcis in position.

"In the lower leg the middle third is generally considered the most favorable site; many artificial limb makers prefer amputation at the middle of the leg to any amputation back of the toes. With proper surgical precaution and a good modern artificial limb, end-bearing usually should always be secured and the gait be practically normal. The fibula should always be cut an inch shorter than the tibia and the sharp point of the tibial crest removed in the usual manner. The lower third is not so favorable; the tibia is smaller at this point and not so satisfactory for end-bearing, and circulatory disturbances are not infrequent. In the upper third a very short stump of course gives poor leverage but fair results are sometimes obtained with as little as two inches of bone. However, a stump as short as this is usually inadvisable, as it will ordinarily have to be fitted with the older type of knee-bearing leg—with the tibial stump bent to a right angle; this has only the advantage of direct knee-bearing, which can usually be secured by amputation at the lower end of the femur, and possesses all the disadvantages incident to artificial knee-joint construction.

"Emphasis needs to be laid on the fact that the old 'site of election' (four inches below the knee) was intended to produce this direct knee-bearing stump and must now, therefore, be entirely disregarded.

"In the thigh the best amputation is, of course, one just above the condyles; when conditions permit, the patella may with advantage be utilized to cover the end of the femur. (The preservation of a part of the condyles, with the patella imbedded in them, is favored by some limb makers, as it enables the weight of the apparatus to be borne by the leg itself.) Above this point all the length possible should be

II

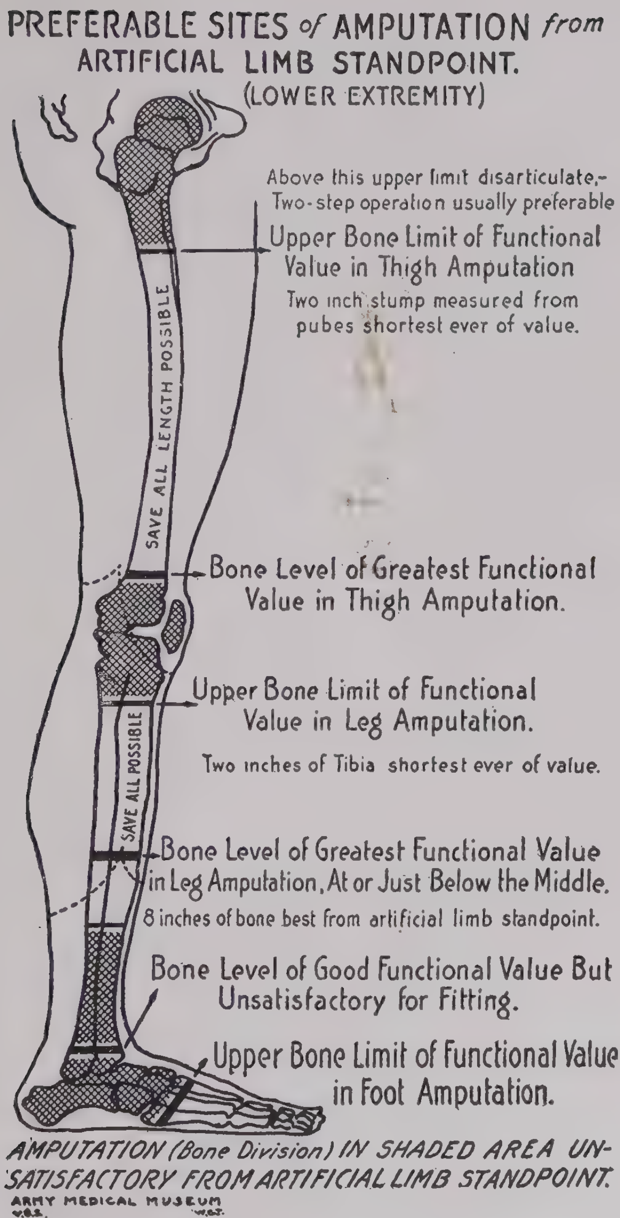

Fig. 182.—Courtesy, "*The Military Surgeon.*"

saved, as the possibility of end-bearing decreases rapidly as the upper limit of usefulness as regards leverage is approached. A stump in which the bone is less than three inches, measured from the pubis, is of little value, and exarticulation is preferable.[1] The linea aspera requires attention in the same manner as the crest of the tibia.

"To avoid shock a subtrochanteric or intratrochanteric amputation may be first performed by the flapless or short flap method, and the removal of the end of the bone left for a later period.

"It is now possible to fit an exarticulation of the hip with a very satisfactory appliance; in some cases the gait is even better than with the shorter stumps."

The best functional result in all amputations depends upon proper surgical procedures at the time of operating and upon the subsequent care of the stump. During the operation the following points must particularly be borne in mind: (1) The periosteum should be carefully severed with a knife just above the level at which the bone is to be divided, as shredded periosteum frequently causes exostosis and spur formation; (2) at least one inch of the nerve should be removed by drawing it down from its sheath and severing with scissors or a knife, and then suturing the sheath over the retracted end; (3) all blood-vessels should be carefully ligated instead of trusting to crushing with artery forceps; (4) a sufficient amount of muscle and fascia should be drawn over the end of the bone and sutured with catgut; (5) the viability of the skin flaps should be assured; it is better to only partially approximate these flaps rather than submit them to undue tension.

The subsequent treatment of the stump is constantly directed toward overcoming muscular weakness and limitation of motion. Lack of sufficient strength to successfully use an artificial limb is one of the chief causes of discouragement in the patient. Pain and tenderness in the stump will cause the patient to postpone all efforts to use the member thus causing more or less atrophy from disuse. Limitation of motion will often prevent the application of an artificial appliance and will further rob the patient of the incentive to use the part. All of these conditions tend to destroy the best functional result. To overcome these conditions, certain routine measures must be applied to the stump combined with functional re-education of the member.

A systematic plan of treatment destined to meet all indications is set forth in instructions issued by the Surgeon General's Office of the United States Army.

"While the incision is healing, at each dressing the stump should be

[1] This statement has recently been contested by some excellent surgeons who claim that the head of the femur left intact facilitates application and function of artificial appliance.

moved to the full limit in the opposite direction to that in which a contracture is likely to develop. In forearm stumps, movement should be carried out in supination and extension; in upper arm amputations, in an upward and backward motion; in the lower leg, in extension and in thigh amputations, in extension (securing hyperextension) and adduction. It is usually advisable to keep all stumps elevated while the patient is recumbent and, therefore, particular attention should be directed to thigh amputations because this position favors a flexion contracture; to counteract this tendency it is recommended that once or twice each day the pillow be removed from under the stump and placed under the buttock, thus allowing the stump to drop into hyperextension. Further, advantage should be taken of the position in which the stump is dressed in order to guard against the tendency to contracture; thus in forearm stumps, where supination is hardest to control, the dressing should be applied so as to maintain the bones in this position. When the incision has had to be left open, movement of the joint in the other directions, also, should be added as soon as conditions permit.

"As soon as the wound is healed, or practically so, and while the patient is still confined to bed, the following routine (modified from Hirsch) is begun:

"1. *Massage.*—The stump should be massaged for a period varying from ten to thirty minutes, once or twice a day, according to its size and position. The region of the incision should naturally be avoided for the first few times and care taken not to make undue tension on the fresh scar. As rapidly as the tolerance of the stump will permit, the depth and the force of the massage should be increased up to the full normal limits.

"2. *Bandaging.*—After the massage, the stump should be redressed with a cotton dressing, bandaged snugly in place, or if it is well healed, a bias flannel bandage alone may be used. The latter, when properly applied in several layers, gives a firm, even pressure.

"3. *Pressure Exercise.*—The patient is directed to press the end of the bandaged stump against a cushion, placed in the bed or against a frame. This must be begun with care, pressure being made at first for only several minutes at four or five hour intervals; if there is no unfavorable reaction, it should be increased gradually up to five or ten minutes every two hours and then every hour.

"4. *Movements.*—After each pressure exercise, active movements of the stump are to be made in all directions, to the full limits of the joint motion, for three to five minutes. Later, some form of resistance movements may be added to advantage, in order to still further build up the strength of the muscles controlling the stump and so make the early use of the artificial limb more easy.

"5. *Baths, etc.*—Hydrotherapy in the form of hot packs or warm baths, or electric light baths are to be used as indicated to improve the circulation and hasten absorption. The contrast bath is particularly valuable, the rapid dilatation and contraction of the blood-vessels which it produces causing a marked improvement in the local vascular and nervous tone; the simplest method of application consists in the use of two buckets, the stump being plunged first into the hot water and then into cold, as rapidly as the patient can change it, for five or ten minutes.

"When the patient is able to leave the bed, the measures just outlined are to be continued, but in the case of leg amputations the pressure exercise is to be discontinued as described and direct weight-bearing on the stump begun. A stool of the proper height and a cushion are provided and the patient, supporting himself with his hands, allows at first only a little weight to rest upon the bandaged stump; the amount of weight borne and the time are then gradually increased, in a manner similar to that used in the pressure exercise in bed, until the entire weight can be taken on the stump. The patient may then carefully begin to hammer on the stool with the end of the stump, in imitation of the pounding which takes place in walking with an artificial limb provided for end-bearing. As soon as the patient can stand alone for a long time without getting tired, and with no other support than that needed to balance himself, a temporary leg, properly provided for end-bearing, may be fitted and walking begun, crutches being used guardedly and dispensed with as soon as possible. For a long time, however, the patient should continue to practise standing on the bare stump on a hard surface three times a day.

"The value of end-bearing is generally admitted. The measures suggested, both with respect to the amputation and the care of the stump, are simple and have borne the test of clinical experience. Their persistent use is urged upon all. While it is recognized that in very many cases the presence of long-continued infection will seriously delay the institution of proper after-treatment, yet much good may still be expected even when begun late, and there will be a large number in which the routine may be followed from the first. The ideal cases will obviously be those requiring reamputation, which will naturally be deferred until entirely favorable conditions can be secured and which can, therefore, be performed solely with regard to the requirements of the artificial limb. Even when the attempt to secure end-bearing is unsuccessful rigid adherence to the routine just described is still to be insisted on; the improved conditions of the stump, the greater freedom from pain and the avoidance of much of the discomfort usually associated with the early use of an artificial limb are more than sufficient to repay one for the additional trouble.

"The joint motion should be tested by the surgeon at regular intervals, particularly in bed-ridden infected cases, in order to be certain that the full range is retained. At the elbow, in addition to verifying the presence of complete flexion and extension, the freedom of rotation of the radial head must be determined and particularly with reference to outward rotation (supination); the value of the movements of pronation and supination in activating the artificial hand will de-

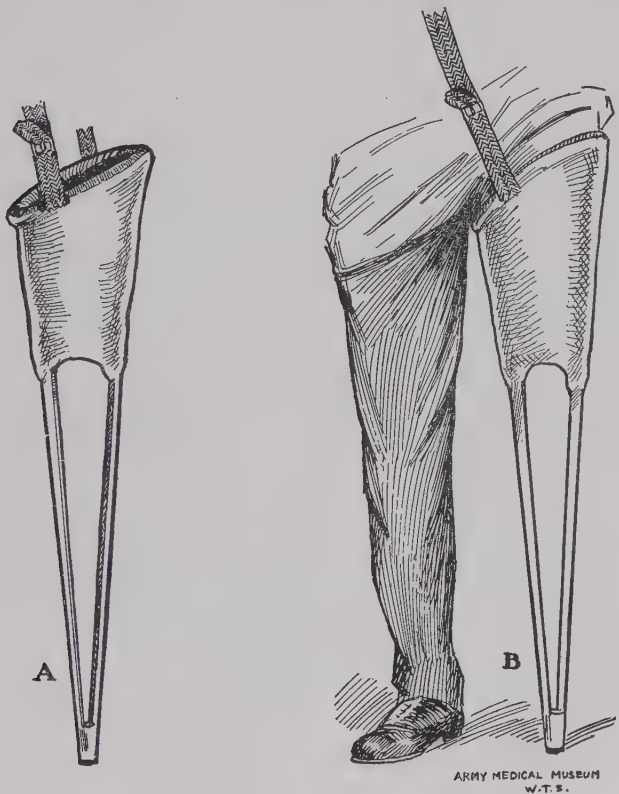

Fig. 183.—Temporary artificial legs. (*Courtesy, "The Military Surgeon."*)

pend upon the degree possible, the loss of even a few degrees making a great difference. Of the movements of the shoulder girdle (upward, downward, forward, backward, and circumduction), the upward and backward ones are the most important; these may be easily tested with the patient lying at the edge of the bed or turned on the opposite side. At the knee it is well to remember that there are normally a few degrees of recurvation. In testing the hip, the presence or absence of flexion deformity may be determined (following the method used in hip disease) by flexing the opposite thigh fully on the trunk, the stump rising from the bed when a contracture exists, or with the patient

lying on the face, the degree of hyperextension may be determined (again as in the similar test used in hip disease) by lifting the stump with one hand while holding down the buttock with the other; in testing the amount of adduction, movement of the pelvis should be controlled with one hand while the other manipulates the stump."

In order to accustom patients to the early use of the stump and limb, and to prevent undue atrophy and shrinkage of the member, temporary artificial limbs have been devised for the use of amputated cases among the soldiers in the United States Army. These temporary appliances also enable early introduction of functional re-education as a definite part of the therapeutic treatment of these cases.

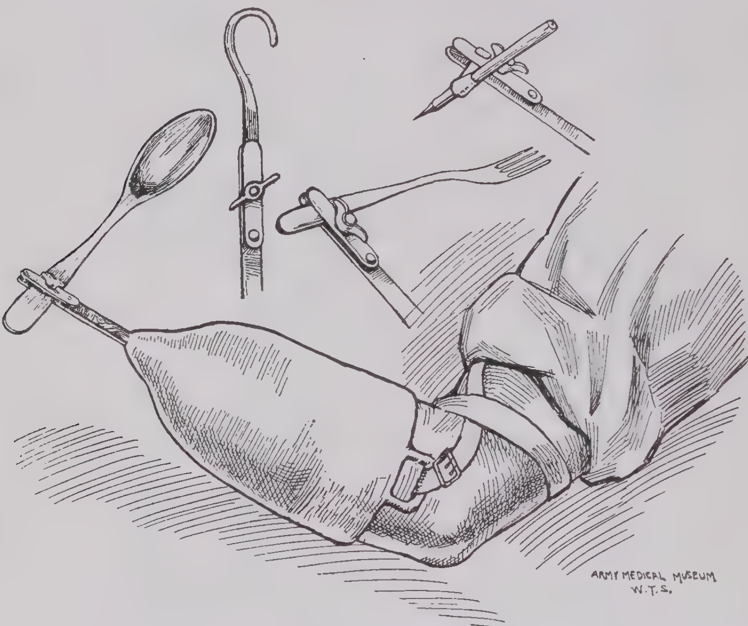

Fig. 184.—Temporary artificial arm, plaster paris socket, with various appliances which help to stimulate the early use of the remaining portion of the member. (*From "The Military Surgeon."*)

These temporary limbs are made by covering the stump and limb with felt, then moulding a plaster-of-Paris socket carefully over the part and fitting it snugly against the end of the stump and the tuberosities which must help support the weight. Into this plaster-of-Paris socket are incorporated a stock frame, similar to the lower portion of a crutch, when an artificial leg is desired; or a stock clamp made of a piece of flat iron with wing end and rivet, when an artificial arm is desired. Rings are securely embodied in the upper end of the plaster socket into which web straps can be inserted in order to fasten the socket to the body. Fig. 183 illustrates these temporary artificial legs

while Fig. 184 shows an artificial arm with the various utensils which can be attached to the clamp.

Many other appliances can be incorporated in these artificial arms. For instance, one arm socket has attached to it a tennis racket and this patient has become an expert tennis player although he has lost his forearm at the middle third. Another patient has an attachment on his plaster socket which enables him to play golf while still another enjoys a game of billiards by means of a special ball and socket joint attached to his artificial appliance. Special hooks and clamps have been invented which enable the grasping of saws, chisels, hammers and other tools thus enabling these patients to work, thereby

Fig. 185.—Tennis rackets, billiard cues, golf clubs and other appliances can be fastened to these sockets.

gaining more and more strength in the member plus the psychotherapeutic benefits of both work and play (Fig. 185).

A full description of these temporary appliances can be found in the *Military Surgeon* for April, 1918. Every surgeon caring for the accident cases in industry should familiarize himself with these advanced methods of handling amputated cases. No longer should we be contented with merely operating on these patients securing good surgical results and then allowing the patients to wait several months before securing the artificial limb, finally leaving the application of this limb purely to the judgment and commercial instincts of the artificial limb manufacturer. The fitting of the permanent ar-

tificial appliance is just as definitely a part of the surgeon's work as is the performing of the operation.

Lt. Col. David Silver says:

"In studying the problem of the artificial arm, one is struck again and again by the value of relatively simple appliances and the importance of thorough training in their use. With a simple wrist strap, an armless man is able to dress and feed himself and do most of his ordinary daily acts. A strap over the shoulder, properly provided

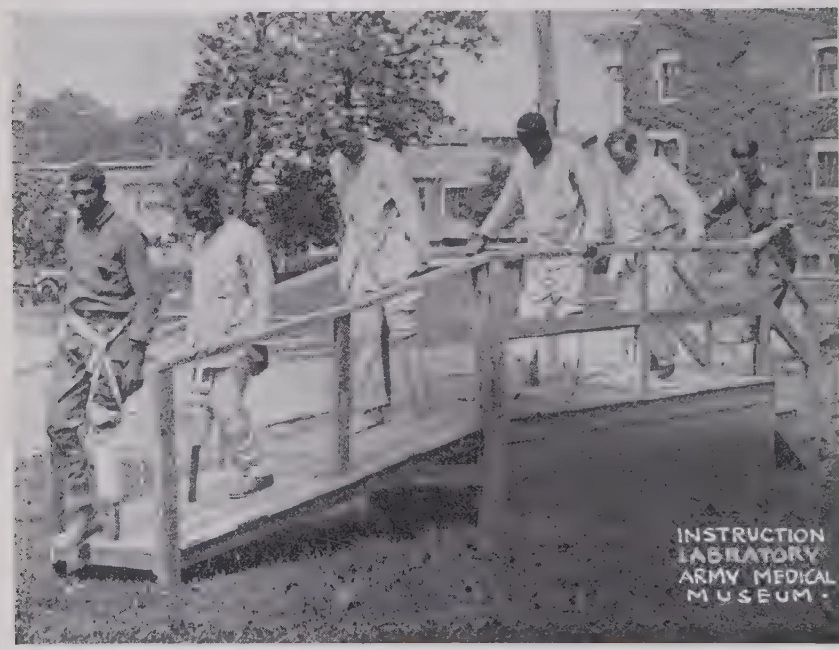

Fig. 186.—Teaching amputation cases to use artificial legs at Walter Reed Hospital.

with a ring, is sufficient to enable the one-armed man to plow, use a wheelbarrow, spade and pitch hay. A single working appliance has enabled a man who suffered a disarticulation of the right shoulder and an amputation of the left forearm to be entirely independent. After all it is a matter of a little brains and much perseverance."

During the long weeks of convalescence following amputations, the surgeon has it within his power to imbue these patients with the sentiments expressed by Michael Dowling who philosophically says, "A man may be worth $100,000 a year from his neck up and worth only $1.50 a day from his neck down."

CHAPTER XL

THE EMPLOYEE'S FOOT

After the present war millions of young men will be returned to civil life who have learned the lesson of the proper care of the feet. Every soldier in the army, including medical officers, realizes that as a nation we have displayed extreme ignorance in the past regarding the type of shoe worn, the health of the foot and the resulting lowered efficiency.

Industrial surgeons can increase the competency of the working forces and can reduce the time lost from work by giving more scientific, as well as common sense attention to the employee's foot. Not only will the comfort and happiness of the employees be increased, but the financial returns from this service alone will almost pay the expenses of the doctor's office.

The shoes of the working man and woman should receive our first consideration. Very few people wear proper shoes. As a rule they are either too narrow or too short. Often the narrow shoes with pointed toes are bought for dress-up purposes and when they become a little worn out are used for work. Heels are usually too high, especially among the women employees, many of whom insist upon wearing the high French heels while at work. Oversized shoes are worn by some employees and are equally bad as their feet are thus subject to trauma from the shoe rubbing up and down.

Accidents, especially from falls, frequently result from faulty shoes. A sole which is worn nearly through permits a nail or splinter to puncture the foot. A loose, flapping sole will often cause a fall which results in a few days time lost from work or even permanent disability. High heels worn by women are a common cause of falls while descending a flight of stairs. During one year I treated fourteen fracture cases among girls and all but four of these resulted from falls which could be traced to their high heels. The factory inspector of one of our largest industrial states recently told the author the fracture rate from accidents had increased almost 50 per cent. during the last year (1918); he stated that this was due to the greater number of women employed in industry since we entered the war and that the large percentage of these fractures were due to faulty shoes. He had just inspected 700 women workers in one factory and only fifteen of these were wearing shoes with a low, common sense heel.

The minor foot ailments which result from wearing the wrong type of shoes not only cause an actual loss of time from work but result in a mental and physical attitude on the part of the affected employees which materially decreases their efficiency. Such people are uncomfortable and cross and their mind is on their painful feet more than on their work. Their speed is slowed up and they must frequently sit down and rest. Driven to despair, they try to operate on a corn or ingrown toe-nail or to open a blister and as a result infections often develop. Many cases of prolonged disability from infections following these self-attempted operations have been seen by every surgeon in industry.

It is quite obvious, therefore, that more attention must be paid to the shoes worn by employees. Now is the logical time to persuade all men to adopt a shoe similar to the Munson last used in the army. A shoe made along these same lines for all men workers should be strongly advocated. A nation-wide educational campaign, pointing

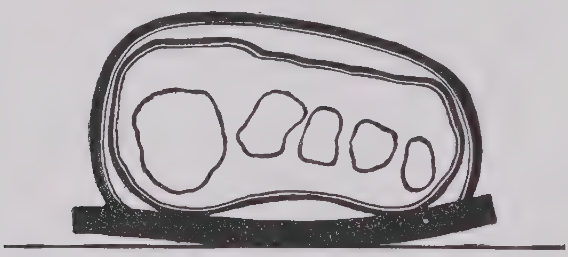

Fig. 187.—Illustrating foot resting on the two sides of a concave inner sole without support to the transverse arch. (*Rugh, in Journal A. M. A.*)

out the advantages to both health and efficiency gained by wearing proper shoes is certainly indicated and the surgeons in industry are in position to take the lead in such a campaign.

The little book entitled "The Soldier's Foot" by Colonel Munson, M. C., U. S. A., should be the guide of every surgeon in advising his patients regarding the proper care of the feet.

The Munson last is a wider shoe at the toe than is normally worn by civilians. As a result the toes are not cramped and the muscles of the foot have freer play, and room to develop and strengthen. When properly fitted, there is about two-thirds of an inch between the longest toe and the end of the shoe. The heel is held firmly in the shoe and the forefoot fits snugly against the vamp. The ball of the foot rests securely in its seat near the posterior turn of the sole. The sole is slightly convex, conforming to the concavity of the foot, instead of being a concave sole as is usually the case with so many of the shoes worn by working men and women. Fig. 187 shows the lack of support to the transverse arch afforded by such shoes.

Many conditions, especially corns, callosities, blisters and early signs of flat-foot will disappear when the feet are fitted with the proper shoes, for instance this Munson last.

In examining applicants for work and in examining old employees the physician in industry should always examine the shoes, as well as the condition of the feet. Tactfully the socks should likewise be examined and when dirty or containing holes or too short, instructions concerning the proper type of sock should be given. When ill-fitting shoes are worn the dangers from the same should be pointed out and the proper type recommended. Such employees should be re-examined to ascertain whether the recommendations have been followed. Just as in the case of eye conditions or bad teeth so should the feet receive the same attention and when necessary loans should be advanced by the Employees Service Department for the obtaining of proper shoes, as is done for the buying of proper glasses.

Foot disabilities are so common that few concerns could afford to reject such cases for employment and, in fact, such a course would work great injustice, but the efficiency of the working force can be maintained at a higher standard if careful selection of jobs is made for such people. Employees with the following defects should always be assigned to the sedentary occupations, where foot power is not so essential: (1) flaccid flat feet, with marked abduction or eversion; (2) arched or spastic flat feet; (3) disabling arthritic conditions following trauma or disease; (4) marked callosities; (5) certain deformities following fracture, as pes varus or valgus; (6) painful bunions or extreme and painful hallux valgus; (7) weak feet, from partial amputations or severe derangements of the joints, especially of the great toe; (8) painful heel when due to exostosis of the under surface of the os calcis.

When employees are affected by any of the following foot conditions corrective measures can be instituted that will make most workmen fit and efficient for practically any type of employment: (1) flat feet without much abduction or eversion; (2) less marked pathologic conditions which apparently have existed for years without evident trouble; (3) weak and poorly developed feet without pathologic defects; (4) hallux valgus, uninflamed bunions, mild claw toes, hammer-toes and ingrown toe-nails; (5) corns, blisters, callosities, etc. Employees with such conditions can usually be relieved by properly fitted shoes, by alterations of the shoes, as inserting a wedge along the inner sole and by such minor operations as may be indicated. Such relief is certainly within the province of industrial surgery.

Symptoms arising from foot ailments, especially in cases of flat feet, are often not limited to the extremities alone. Pain in the ankles

and calves is very common; sciatica is frequently complained of and is usually relieved by correction of the foot trouble.

These symptoms, in addition to affecting the working ability, frequently give rise to claims for compensation. Often the pain in the back, or the sciatica is blamed on a strain in lifting, a fall or the result of jumping from a ladder or platform. Therefore, it is very important from a medicolegal standpoint to examine every employee's feet, to note every pathologic condition and the symptoms which may arise from the same, and to make careful records concerning these. In the author's experience, in at least six cases excessive claims for damage have been refuted because these employees' records showed the pathologic foot condition to have existed to practically the same degree at the time of their employment.

TREATMENT OF SPECIFIC CONDITIONS

Corns.—These are localized callosities of the skin of the foot and are due to continued pressure or injury from ill-fitting shoes. The first step in curing corns is to remove their cause. Therefore, correction of the shoes is the first essential. The commonest palliative treatment is to shave or pare the corn but this gives temporary relief only. After we began to pay considerable attention to corns in the surgical dispensary great numbers of these cases reported. The routine treatment consisted of the following:

1. For small external corns and small internal corns a small strap of adhesive plaster was applied tightly over the affected area. This was worn for a week, at the end of which time the employee reported again and the plaster was removed. The corn was usually so softened that the doctor could readily remove it without any bleeding. After removal iodin was applied. If necessary, the adhesive plaster treatment was continued for two or three weeks. Naturally the shoes were corrected in every case.

2. For large corns, callosities and the large soft corns (those between toes) a corn salve was applied consisting of the following:

Salicylic acid	40 parts
Vaselin	30 parts
Lanolin	30 parts

This ointment is smeared immediately over the corn and covered with a strip of zinc oxid plaster. These cases are given a small amount of the ointment and instructed to soak the foot in warm water every night and apply it as above described. After the fourth application the employee reports to the doctor who is then able to remove the softened corn, usually without any sign of bleeding. The area is touched with iodin and if a small area of the corn or callosity remains

adhesive plaster is again applied and usually after three or four days can be removed and the corn has disappeared.

Callosities.—Callosities are enlarged corns, usually appearing on the soles of the feet, especially at the base of the second toe. They are often indicative of a broken transverse arch and usually accompany the condition known as Morton's toe. They also appear over the tops of toes in marked claw feet or in the condition known as hammer-toe. Again they may appear over a bunion. These large callosities frequently give rise to considerable pain and cause much disability.

They are treated as described for corns. Shoes with correction of flattening of the transverse arch are necessary for the complete cure. Various types of pads and arch supports are sold for this condition but a cleat of leather one-eighth of an inch thick and one inch wide, fastened to the sole of the shoe just back of the metatarsal heads is the most practicable support. This, combined with proper toe exercises, will usually restore the function in this arch.

Blisters and Abrasions.—These commonly result from the wearing of large size shoes and the constant rubbing of the same on the part. They are most commonly located on the heel.

These should be painted with iodin, pierced at their lowest border and after the fluid has been removed, strapped firmly with zinc oxid plaster. Abrasions may first be treated with some soothing powder, such as bismuth subnitrate and then covered with the adhesive plaster.

Fissures.—Cracks or fissures of the skin between the toes and on the soles of the feet are rather common among employees engaged in heavy work in hot places and who are constantly on their feet. They are usually quite painful and tend to bleed. Very serious infections have occurred from these fissures.

The feet should be washed and dried thoroughly, rubbed with alcohol and dusted over with boric powder or bismuth subnitrate, or even with talcum powder. Cauterizing of the fissures with silver nitrate once or twice will assist in the cure. After this treatment they may be covered with adhesive plaster.

Sweaty Feet.—This is a very common affliction among working men and causes great loss in their efficiency and may result in actual disability. As a result of the sweating the skin on the sole and between the toes becomes soft, whitish and dead looking and blisters and abrasions form very easily. Such a condition is usually the sign of falling arches and its cure, therefore, implies the toning up of the foot by proper exercises.

Frequent bathing of the feet, changing the socks almost daily and disinfecting the shoes are absolutely necessary for continued cure. The employee should be given a solution, containing formalin ½ per cent., choral hydrate 3 per cent., and instructed to rub this on the feet

every night after bathing them in very hot water. This should be applied with a cloth as it may cause drying and cracking of the hands. No more important preventive work can be carried on in the plant dispensary than this correction of sweaty feet.

If bromidrosis is present, or results after the above treatment, the condition should be treated by bathing in hot water followed with cold and then the foot should be rubbed with olive oil.

Ingrowing Nails.—This condition, most common in the great toe, consists of an inward curving of the nail which then grows down into the flesh. Pain is often marked and the employee usually tries to relieve the condition by cutting away the nail. Infection is very frequent and a chronic suppurative condition may persist for months about the imbedded nail. I have seen one case of general arthritis in which the entire body was unsuccessfully searched for the focus of infection by the attending physician, when, after about two weeks the interne discovered a low-grade suppurative condition about an ingrown toe-nail. Curing of this condition resulted in recovery from the arthritis. Many cases of severe infection occur from ingrown toe-nails. Such a condition is caused by pressure of the socks or shoes, combined with improper trimming of the nail.

The toe-nail must be trimmed squarely across. In mild cases raise the edge of the nail with a sterilized probe and insert a small pledget of cotton. By reinserting larger pledgets daily the nail may be forced away from the flesh. In the more serious cases or where infection is present a local anesthetic of $\frac{1}{2}$ per cent. novocain should be injected and the outer quarter of the nail removed completely to its base. Iodin sterilization must precede this operation and should also be applied afterwards. Apply hot dressings for twenty-four hours in case of infection. Subsequent dressings may consist of white precipitate ointment covered with a small piece of sterile dressing, held in place by adhesive plaster.

Hallux Valgus or Bunions.—These are usually the result of faulty shoes. The transverse arch is flattened in a majority of the cases. The condition consists of a deflection of the great toe toward the outer side of the foot, with an enlargement (exostosis) of the lateral aspect of the joint.

Mild cases will usually improve by the use of a proper shoe, such as the Munson last. In case the bunion is irritated a bunion ring divided in half and placed just back of the point of irritation to protect rubbing from the shoe and held in place with adhesive plaster gives great relief. When the entire bunion ring is applied that portion in front of the bunion tends to increase the deflection of the toe and, therefore, should never be used. In serious cases, one of the classical bunion operations should be performed. The best operation consists

of the removal of the exostosis, combined with the removal of a wedge-shaped piece of bone from the proximal end of the phalanx, which is then given the proper concavity required for articulation. This is not an operation suitable for the plant dispensary but should be performed at the hospital.

Hammer-toe.—This deformity, usually of the second toe, consists of a contracture in dorsal flexion at the metatarsal phalangeal joint accompanied by "contracture at the plantar flexion at the proximal interphalangeal joint." A corn or callosity forming on top of the toe usually causes great distress and much disability.

This condition can practically always be cured without amputation, which should be condemned as it leaves the foot in a weakened condition. Tenotomy of the extensor tendon just back of the metatarsal phalangeal joint will usually permit the straightening of the toe. When necessary a wedge-shaped piece of bone with the base upward can be removed from the interphalangeal joint. After the operation a small splint is applied. This can be made from a tongue depressor. Deformities of the little toe, similar to the above, are very common and should be treated in the same way.

Foot Strain.—This is commonly seen in those cases described as "flat-foot." It may be of the acute variety where the condition of the foot strain occurs without any pathologic change in the arches of the foot. Such a condition is common among employees who have been transferred from sedentary work to occupations keeping them constantly on their feet and especially when this is accompanied with carrying of loads. It is characterized by severe pain and the foot may become swollen.

Chronic foot strain is usually accompanied by changes in the arches or other pathologic change in the foot. The three commonest types are: (1) flaccid feet with flattening of the longitudinal arch; (2) rigid feet, usually following arthritic changes, such as adhesions and periarticular infiltrations. When occurring in a single foot it must be differentiated from tuberculosis of the joints or bones of the feet. An x-ray examination in doubtful cases should always be made; (3) spastic feet, which are usually due to a definite spasm of the peroneal group of muscles; (4) osseous flat-foot, a condition in which bony changes have occurred after the arches have fallen, resulting in a rigid type of feet.

Treatment of the acute foot strain consists of rest, strapping of the foot with adhesive plaster and a gradual return to the work causing the condition.

Ordinary flat-foot is usually treated by the use of plates or supports worn within the shoe. They can best be treated, however, by strapping the foot with adhesive plaster, as illustrated in Figs. 188, 189,

190, 191, 192, 193, and by suitable alterations in the shoes. The best alteration is a simple wedge of leather, $\frac{1}{4}$ of an inch thick and tapering to $\frac{1}{8}$ of an inch, placed between the layers of the sole and heel along the entire length of the inner side of the shoe. Combined with

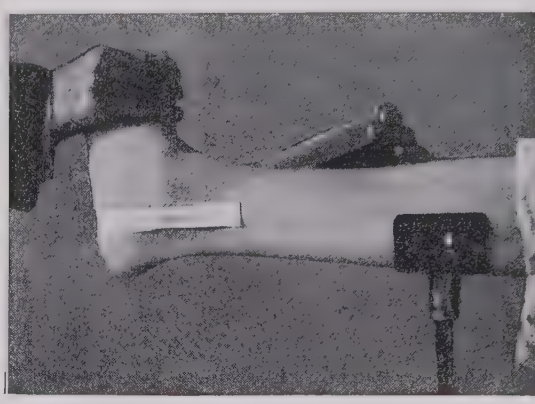

Fig. 188.—Strapping of the foot. Application of the first strip, seen from the outer side. (*From Medical War Manual No.* 4, "*Military Orthopædic Surgery.*")

these changes suitable foot exercises should be given, such as the following:

1. Stand with feet parallel; roll them outward, standing on the outer border; rise on the outer borders without twisting the legs or bending the knees; walk in this position.

Fig. 189.—Application of the first strip, seen from the inner side. (*From Medical War Manual No.* 4, "*Military Orthopædic Surgery.*")

2. Stand on a walk or thick board, toes overhanging the edge. Bend the toes over as far as possible, repeating several times.

3. Exercise the bare feet by walking on a board tapering from the center to the edges by a 35 degree angle. Employees with flat feet,

forced to stand all day should be provided with such a board which they can stand on at intervals several times a day.

The rigid type of foot should be converted into the flaccid type by the use of alternating baths and massage repeated daily. If the

FIG. 190.—Application of the second strip, seen from the outer side. (*From Medical War Manual No.* 4, "*Military Orthopædic Surgery.*")

rigidity is more marked it may be necessary to adopt forcible manipulation under anesthesia. After the condition has become flaccid it can be treated as described above or in the more serious cases it may be necessary to apply plaster-of-Paris dressings.

In the spastic type it is often necessary to resort to tenotomy of

FIG. 191.—Application of the second strip, seen from the inner side. (*From Medical War Manual No.* 4, "*Military Orthopædic Surgery.*")

the peroneal group of muscles in order to convert this into the flaccid type, after which the treatment consists of holding the foot in the position of supination and adduction for three or four weeks by means of plaster-of-Paris casts. After this, strapping of the foot, proper foot

exercises and alterations of the shoes must be carried out until recovery is complete.

These conditions of the feet, which are commonly considered as belonging to the round of orthopedic surgery must receive the most

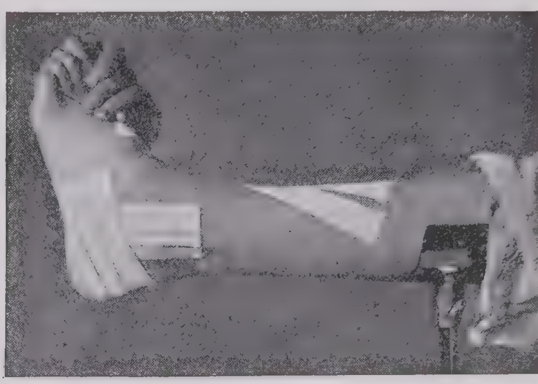

FIG. 192.—Completed dressing, seen from the outer side. (*From Medical War Manual No.* 4, "*Military Orthopædic Surgery.*")

careful consideration of every industrial surgeon. He should not consider himself qualified for his position until he has completely learned the various orthopedic methods necessary to overcome this

FIG. 193.—Completed dressing, seen from the inner side. (*From Medical War Manual No.* 4, "*Military Orthopædic Surgery.*")

type of disability, which has been such a source of financial loss to both the employee and employer. This short résumé concerning the care of foot conditions is given in order to stimulate surgeons in industry to meet this great responsibility.

Part V

COMPENSATION. INSURANCE. MEDICO-LEGAL PHASES

CHAPTER XLI

EMPLOYEES' COMPENSATION FROM THE MEDICAL VIEWPOINT

In 1911, the first Employees' Compensation Act was passed. Since that time 37 of the 48 States of the Union have adopted similar laws. The rapid spread of this principle of compensation, so closely related to health insurance, has inaugurated a form of socialized medicine which is bound to extend into other fields.

In the states where the compensation acts are best administered, the "shyster lawyers" commonly known as the "ambulance chasers," no longer carry on their nefarious trade. Likewise the so-called professional "expert witness" who sells his medical testimony to the highest bidder, is becoming less and less a frequenter of our courts.

Employees' compensation has stimulated the growth of industrial medicine and surgery more than any other one thing. Employers have come to realize that the human body is a most expensive machine and must be cared for and kept in good repair. Most of these laws are based upon the theory that one is bound by the natural consequences of his acts. Therefore, if an employer hires a defective workman, as for example, a man blind in one eye, who later meets with an accident during the course of his employment and is totally disabled thereby, for instance, the loss of the other eye resulting in total blindness, the employer is held responsible for this total disability. This has caused many concerns to establish a system of medical examination of employees, especially applicants for work, in order to reduce the number of compensable cases. Such a plan naturally has worked many hardships upon handicapped individuals seeking employment. Fortunately most industries to-day take a broader viewpoint of this work, and have made these medical examinations a definite part of the medical supervision of employees. Such handicapped men are employed on jobs where they can still be efficient and where accident hazards do not

exist for them. In many states, however, industries are still discriminating against those workers who are unfortunate enough as to have physical defects, with the result that man-power in this country is not being used as it should be.

The prevention of accidents is now an established fact and is due in a large measure to the compensation principles.

State compensation boards are constantly emphasizing to employers the importance of engaging only expert surgeons. Even though the initial cost is greater yet the quicker recoveries and the better functional results materially decrease the ultimate expense. One large insurance executive recently said, "Maximum surgical care gives a minimum of bad results."

Mr. Charles F. Andrus, Chairman of the Illinois Industrial Commission elucidates this point by saying: "The Medical Directors of the Commission can do much to assist in encouraging employers to procure the proper kind of medical treatment. They may be shown that there is nothing more costly than cheap medical work. The experience of one large firm in Chicago with their medical department illustrates it. This Company was paying their medical head $75 per month and imagined they were saving money. They concluded to change their system and put a trained surgeon in charge. The first year the medical expense increased 800 per cent. In the preceding year this company had had 31 law suits. In the first year of the new system they had one suit and the Claim Department saved $30,000. This was accomplished in several ways. Regardless of expense, the men would get the proper kind of medical treatment and they were able to return to work sooner. The medical chief told the men the exact truth about their conditions and did not act as a sounding board for the claim agent. The consequences were that the men had confidence in him and the ambulance chasers did not succeed in stirring up trouble. They were ready to make a settlement on what the physician told them as they knew he was telling the truth. Taking into consideration, aside from the actual money saved, the increase of good feeling between the employer and the employee which is so necessary in modern industrial times, it may be readily seen that cheap medical treatment does not pay."

The Industrial Accident Commission of California in their 1918 report, states in this connection, as follows: "The Company with the closest personal scrutiny by its medical chief and the highest type of medical men to do the work, seems to obtain the cheapest and best medical results."

The establishment of many surgical dispensaries in industry has followed in the wake of the compensation acts. For several years a few prominent surgeons have advocated the principle that the greatest

safety precaution for an injured employee is the immediate care of his wound by a competent surgeon. In order to accomplish this it is necessary to introduce surgery directly into industry. Here again quotation from the California Commission is pertinent: "Frequently the course of a surgical case is determined by the first treatments. This leads to the thought that to obtain the best surgical results in accident cases, the injured must fall into the hands of a competent surgeon with the least possible delay. Furthermore, it leads to the thought that unless a doctor is qualified to do major surgery he should not attempt to handle a major surgical case, except in emergency, and

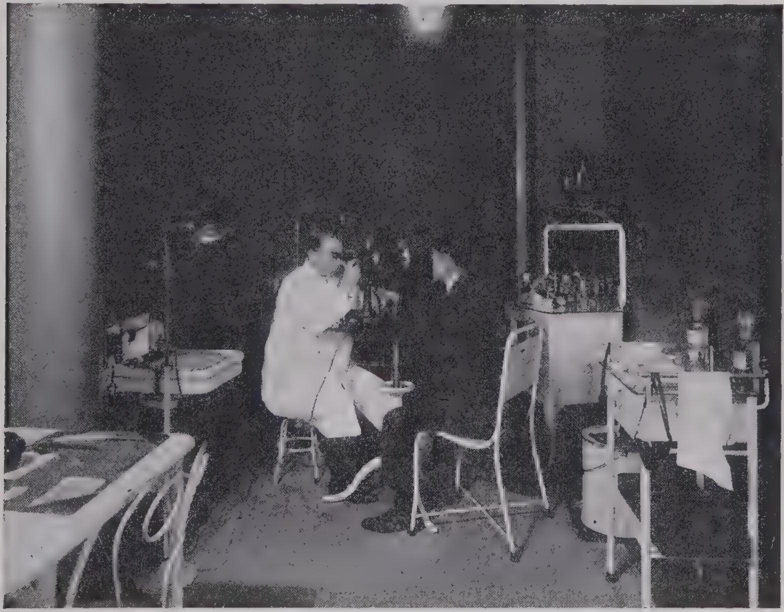

FIG. 194.—The greatest safety measure for an injured employee is immediate, competent surgical care. Prompt attention to eye injuries in this plant dispensary has reduced blindness.

if he is not able to handle major surgery or to perform major surgical operations he is ill equipped to make surgical diagnosis or even to recognize major surgical conditions. The minor surgical case frequently develops into a major case. The less skillful the surgeon the more frequently this happens."

Now that some states are including certain occupational diseases among the compensable conditions, industries are being stimulated to employ expert physicians in order to discover these diseases early and to establish a proper preventive program against them.

Thus it is quite evident that the employees' compensation legislation in this country has advanced industrial medicine and surgery at least

a generation. It can be irrefutably assumed that if compensation was extended to include all sickness, as proposed in health insurance, it would not only advance industrial medicine but all medical practices. In fact, a beneficent system of socialized medicine would rapidly ensue.

The best plan of accident compensation has existed in a few industries even prior to the Compensation Act. This is based upon the humanitarian principle that the employer is completely responsible for the results of all accidents occurring to employees during the course of their employment. Such a concern considers the repair and restoration of the injured employee a moral and economic responsibility just as much as the repair of a broken machine. Therefore, prevention of accidents, the best kind of medical treatment, no matter what the expense, the complete rehabilitation of all injured, and their re-employment in suitable work is definitely included in their compensation program. If the injured employee is deprived of his earning power because of the accident these concerns agree that he should go on receiving his full wages the same as though he was working.

Such a policy as the above is broader and more equitable than any compensation law thus far imposed upon industry. Naturally, a concern governed by this moral responsibility, exacting as it does greater compensation than is legally required, is forced to carry its own insurance. These employers give the workman the benefit of the doubt and never quibble over legal technicalities involved in the settlement, as so often happens when an insurance company is making the settlement.

The author had the privilege of working for such a broad-minded industry. During the period of nine years, only six cases were carried to the courts for settlement. In two of these, compensation was refused by the court because the concern was not responsible for the accident; in the third, compensation was refused because the disability was due to a diseased condition and not to the coincidental accident; and in the other three, the claimants were proven to be malingerers. This does not mean that all injured employees were given a money settlement, for many claimed damages who did not deserve them. But both the manager and the medical staff gained the reputation throughout the working force of giving a square deal to all. This greatly facilitated the handling of these cases. When a concern adopts this policy it is practically compelled to employ its own medical staff. If the care of the injured employee is left to disinterested surgeons the loss of time from work usually is increased. Again if the employee loses the personal touch with the management he is liable to become dissatisfied and dissatisfaction is the commonest cause for damage suits. On the other hand, the medical staff of the industry takes a personal interest in the employees and they in turn develop great con-

fidence in the doctors. The company surgeon, as the representative of the management, is best able to encourage the injured man and to allay his fears regarding his rights and his future opportunities for employment with the concern. They are able to "counteract" the effect of the pernicious activity sometimes displayed by well-meaning friends. Thus, by having their own medical staff such an industry saves the time loss and the ensuing expense, as well as the expense of a great number of settlements. The money saved in this way can be used to pay full wages to the injured employees for the entire time they are disabled. This fair treatment on the part of the management develops loyalty and good feeling among the employees which also help in reducing the number of damage suits. There is no question in my mind but that this system, based upon the moral responsibility of the employer toward his employees is by far the most economical plan of compensation which can be adopted by any industry. That the medical expense is also reduced is borne out by the statement of the California Commission which says, "it appears that employers who carry their own insurance and provide their own medical service show the lowest medical cost."

A résumé of the 37 Workmen's Compensation Acts in this country shows many variations in the different states. There are 23 states with industrial boards or commissions to administer the acts; four states each have a single commissioner; and in ten states the courts administer the acts. In 23 of the states the compensation is paid either directly by the employer or by the insurance company indemnifying him. Nine states have state-managed insurance funds in which the employer may secure a policy or he can carry his insurance in one of the privately owned companies; thus the state has entered into competition with private corporations. In only five states is the fund from which the compensation is paid managed completely by state insurance boards. In these five states the rate of premium is fixed periodically, usually semi-annually, and depends upon the number of accident cases the employer has had during the preceding year. The premium rate in many of the privately managed insurance companies is also dependent upon the number of accidents during the preceding year. Naturally the rate in each case depends to a large extent upon the number of the employees and the hazards of the occupations.

In some states claims are paid on the order of the court. In others they are paid directly from the state fund and only on approval of the industrial commission and in a third class settlements are made as required by law between the employer and the injured party and the claim paid direct by the former, only the disputed cases being brought to the commission.

The amount of the weekly compensation varies from one-half to

two-thirds of the wages earned by the injured party. Compensation comes under three classes, namely, for death, for total disability and for partial disability. In addition the laws in the majority of cases provide for medical, surgical and hospital attendance and, in fatal injuries, the burial expenses as well. The arguments advanced against the payment of full wages during the time of disability are that such a plan would encourage malingering; that it is an unjust burden thrown upon the employer as he is not always fully responsible for the accident; or that the employee being a definite part of industry must share a portion of the wage loss following an accident. It would seem that these arguments overlook the fact that the pain and inconvenience suffered by the injured workman cannot be distributed in any way to the employer; neither does the employer share the additional expense laid upon the family when the bread winner is injured. If the compensation acts would provide a more equitable weekly compensation undoubtedly a reduction in the number of claims for permanent disability would follow.

Most of the acts fix a period, known as the "waiting time" during which no compensation is payable immediately following the injury. This waiting time varies with the different states from six days to two weeks, although most of the states pay for the medical and surgical attendance during this period. In a few states when the disability is prolonged beyond the waiting time compensation is then paid from the first day of injury. It is apparent that such a provision is a much greater temptation for malingering than if the injured party was paid full wages throughout. Very definite proof of this fact is found in the experience of the Federal Government, as set forth in the Bulletin of Labor Statistics for December, 1913. "The Federal statute allows no compensation for an injury not continuing for more than 15 days, but where the injury continues payment is made from the first day. This results in the denial of all compensation for disabilities lasting as much as fourteen days or fifteen days, but allowing sixteen days full pay for a disability of a single day, or portion of a day, beyond the waiting time fixed. An amendment, restricted in its application to the Canal Zone, permits compensation under local regulations for all work time lost, and in connection with these facts it may be noted that during the 11 months of 1908–09, that this law was in operation, 55.2 per cent. of all injuries lasted less than 15 days on the Canal Zone, while in all the other branches of the service the number was 40.95 per cent. of the total; in 1909-10, 61.4 per cent. of the injuries on the Canal Zone terminated within 15 days, while in the other branches 38.93 per cent. so terminated; in 1910-11, 73.04 per cent. of the employees on the Canal Zone recovered in less than 15 days, while in the other branches of the service

the number amounted to but 39.35 per cent." During this same period the recoveries from disability lasting from 15 to 21 days on the Canal Zone during the three years 1908-11 amounted to approximately 10 per cent. of the whole as against approximately 14 per cent. in all other branches of the service for the same period. Commenting upon the above facts the Labor Statistician states that there is "ground at least for belief" that this policy in the Federal Government tended to prolong the time of disability. I would say that such figures irrefutably prove that any law which fixes a long waiting time and then provides for the payment of compensation for the full period, providing the disability is prolonged beyond the fixed time, is a direct stimulus for a certain amount of malingering and even tempts the physician to abet the crime.

It is very essential for the surgeon in industry to become fully acquainted with the different compensation acts and especially with the one in his own state. Practically every year the Bureau of Labor Statistics, Department of Labor, issues bulletins, giving a résumé of the Workmen's Compensation Laws in the United States. These are an invaluable source of information to the surgeon. The National Industrial Conference Board in April, 1917, made a very exhaustive study of the various acts in this country and in Great Britain bearing on workmen's compensation and issued a bulletin setting forth the results of this study. The following quotation taken from this report gives a concise statement of what accidents and diseases are included in the various acts:

"Definitions of 'Accident.'—The popular conception of an 'accident' is probably much narrower than the definition which that term now receives in the construction of compensation legislation. The fact is that the original conception has been greatly modified and extended by the adoption of broader statutory language and by administrative construction. The English compensation act, which served as a model for much of American legislation, created its fundamental liability by the phrase 'personal injury by accident arising out of and in the course of employment.' That phrase is identically or substantially contained in the acts of Arizona, Colorado, Indiana, Kansas, Kentucky, Louisiana, Maryland, Minnesota, Nebraska, New Hampshire, New Jersey, Oklahoma, Oregon, and Rhode Island. The qualifying phrase 'by accident' is omitted in the remaining acts, compensation being allowed for 'personal injury arising out of and in the course of employment,' except in Illinois and Wisconsin, where the death or injury is sustained 'while engaged in the line of his duty as such employee,' and Maine, Massachusetts, Montana, Ohio, Texas, and West Viriginia, which omit the word 'accident' and qualify personal injury only by the phrase 'in the course of his employment.'

Washington and Wyoming omit the word 'accident,' the former qualifying the term 'injury' by the phrase 'resulting from some fortuitous event as distinguished from the contract of disease,' the latter using the phrases 'injury sustained in extra hazardous employment,' 'as a result of their employment,' 'while at work on their employer's premises or elsewhere on his business.'

"**Effect of Modification.**—The effect of those verbal modifications of the parent act, the broad construction of which already permitted it to cover many forms of infection by disease and even remote effects of injury, has been to greatly extend the application of the act, from what are popularly considered 'accidents,' to many forms of sickness and to liability for not merely the torts, but the crimes of fellow-employees and third persons beyond the control or reach of the employer.

"**British Definition of Accident.**—The term accident was unsatisfactorily defined in the first English compensation act of 1897, in the opinion of leading commentators, until the decision by the House of Lords in 1903, in the case of Fenton v. Thorley and Company (1903, A.C.43). In that case Lord MacNaghten said:

"'I come, therefore, to the conclusion that the expression "accident" is used in the popular and ordinary sense of the word as denoting an unlooked-for mishap or an untoward event which is not expected or designed.'

"**Separation of Accident and Disease in British Acts.**—In a further decision of the House of Lords in the case of Brinton's Limited v. Turvey (1905, A. C. 230) it was held that an infection to the eye of a workman from anthrax in the wool handled by him was 'personal injury by accident.' All the Law Lords, however, took occasion to expressly emphasize their view that the decision must not be regarded 'as involving the doctrine that all diseases caught by a workman in the course of his employment are to be regarded as accidents.' In the succeeding English legislation of 1906 compensation was allowed for occupational disease, which was, however, made the subject of a separate statute in which twenty-four diseases were enumerated and defined, others being added thereto by an official board of physicians upon the approval of the Secretary of State.

"**American Variations of Accident.**—In enacting the identical or substantial language of the English statute, some states follow it closely as in Michigan, narrow it somewhat as in Nebraska, where it seems to require extraneous physical injury, or as in New York construe it even more liberally through the Industrial Commission, which holds it to be a compensable accident when a street railway process server dies from gangrenous diabetes alleged to result from a fellow-passenger treading upon his toes while the decedent was

returning to his place of employment on a street railway car of the company which employed him.

"**Proof of Accident.**—The occurrence of an accident is generally held to be a mixed question of law and fact, but its meaning when applied to ascertain facts is a question of law.

"**Extension of Coverage by Massachusetts.**—The courts of Massachusetts point out very clearly the extensive increase of liability where compensation is awarded, as in that state, for 'personal injury' as distinguished from 'personal injury by accident.' 'There are no conditions,' says the Supreme Court of Massachusetts, 'which warrant a judicial interpretation of the phrase "personal injury" in the act as meaning the same as "personal injury by accident" or as excluding from the scope of "personal injuries" those instances where a diseased physical condition may have invited, or rendered the employee unusually susceptible to "personal injury."' The word 'injury' in the Massachusetts statute will include whatever lesion or change in any part of the system produces harm or pain or a lessened faculty of the natural use of any bodily activity or capacity.

"**Exclusion of Disease by Ohio, Michigan, Connecticut, California and Iowa.**—Yet the Supreme Courts of Ohio, Michigan, and Connecticut have held that 'personal injury,' 'even without the qualifying word "accident,"' excludes occupational disease, the administrative boards of California and Iowa reaching the same conclusion with respect to the same language,

"**The Massachusetts View.**—The Massachusetts Supreme Court holds to the contrary, including lead poisoning as personal injury, and the Wisconsin Court holds typhoid fever contracted from drinking water supplied by the employer to be a 'personal injury.' It appears to be generally accepted that injuries are to be compensated irrespective of pre-existing tendencies or the subnormal condition of the injured workman, provided that the immediate injury, whether accelerating or exaggerating the pre-existing condition, proximately arises from the employment.

"**Causes of Accident.**—It is not necessary that the injury should arise from an extraneous cause. It may be caused by nervous shock without external physical change. It may result from the wilful or even criminal act of another, as where a watchman is wounded while defending his employer's property, or a foreman is assaulted because of the administration of a reprimand for doing work improperly, or a mill superintendent murdered by an ejected person.

"**Further Broadening of the Liability of the British Act.**—The restrictions diminished by the elimination of the word 'accident' from the definition of liability are yet further lessened by striking out the phrase 'out of' and permitting liability to remain merely for in-

juries received 'in the course of employment.' 'Many accidents occur in the course of, but not out of, the employment; but I am unable to think of any that could arise out of, and not also in the course of the employment.' These words by Justice Farwell express the effect of the elimination of 'out of' in many state acts, for it is obvious that an injury may be received in the course of employment while the cause is unrelated to such employment.

"**Elimination of 'Out of.'**—The phrase 'out of' has been generally held to fix the cause or source of the accident or injury, while the term 'in the course of' defined the time, place, and circumstance of its occurrence. Numerous decisions of the courts respecting statutes carrying this conjunctive phrase emphasize the fact that mere injury while performing a duty of service gives no claim for compensation unless an essential relation is established between the employment and the injury. This requirement, of course, fails when it is merely necessary to show that the injury arises during 'the course' of the employment. It may thus be caused through the violence of a fellow-workman or a stranger, but not by 'horseplay.' The Ohio Industrial Commission awarded compensation to the dependents of a stenographer because of her murder by a jealous suitor while taking the dictation of her employer.

"**Special Liability Suggested by Connecticut Commission.**—'Injuries during the course of employment' are beginning to include, and have already by precedent included, forms of infection or contagion which are incidental rather than inherent in employment. This tendency, necessarily reflected in an increasing severity of physical examination in the jurisdiction in which it is most evident, doubtless inspired the suggestion of the Connecticut Commission in 1915, that persons suffering from inherent physical defects, making them a peculiar hazard, shall be permitted to make special stipulations with regard to compensation, subject to the approval of the commission, as a practical means of preventing their exclusion from employment.

"**Proximate Causes of Injury.**—In substantially all state jurisdictions the burden of proof rests on the claimant to show that the accident or injury recited is the proximate cause of the alleged disability or death, but 'proximate cause under the law of negligence always has to be traced back to the conduct of responsible human agencies; under the compensation act the words "proximate cause by accident" in terms relate to a physical fact only, namely, an accident. Hence if the injury or death can be traced to physical cause not too remote in time or place to the accident, then such injury or death was proximately caused by the accident, irrespective of any element of reasonable anticipation. The term "proximate" was, no

doubt, used to exclude physical causes so remote in time and place, or both, as to make them of doubtful value in tracing the relation between cause and effect.'

"**Pre-existing Disease or Injury.**—The view of the Wisconsin Supreme Court seems an excellent statement of the substantial principle. It applies equally to all forms of disease of physical consequence where there is a causal connection between them and the injury. Inasmuch as the employer is said to take workmen as he finds them, he becomes responsible for disabilities which are the direct result of an injury or accident aggravating a previous physical condition. Thus compensation is allowed for death caused through an infected heel blister poisoning the blood stream and causing Bright's disease, or death from pneumonia where the power of resistance has been reduced by an occupational strain, or death following an inflammation of a pre-existing cancer due to an accidental blow, or where a weak heart is impaired by the muscular exertion of the work. Where the causal connection is complete the principle applies, although merely accelerating pre-existing disease, or where the injury ultimates in insanity or suicide. If, however, a second independent cause intervenes at any point the causal chain is, of course, broken and the liability ceases. The question is always one of fact.

"**Aggravation of Injury.**—The aggravation of the injury or disability by the conduct of the workman carelessly, negligently, or unreasonably preventing cure or making the condition worse is ground for stopping compensation. The too early use of a broken limb, resulting in a second injury to it, will not permit a second compensation. A second disability produced by awkwardness or clumsiness as a natural result of the first is, however, further compensable. The prolongation of working incapacity due to the use of intoxicating liquors is not compensable. The Supreme Courts of Wisconsin and Washington have held the employer liable for death or disability resulting from the professional incompetence of the physician supplied by him. Death resulting from an operation necessitated by the original injury is compensable.

"**Refusal of Medical Instruction or Recommendation.**—As a rule, prolonged disability due to disobedience of the physician's instructions is not compensable. The question of whether or not a workman is unreasonable in refusing to submit to an operation advised by a physician to cure disability or save life must rest upon the circumstances of the case. Thus it has been held by a high English authority that it is not unreasonable to refuse to submit to an operation involving risk of life. On the other hand, it has been held unreasonable to refuse to submit to a minor operation to restore the use of a finger or a hand in a skilled trade.

"**Hernia.**—Hernia is a special subject of decision and administrative rule. As a result of many difficult claims and considerable fraud the authoritative rule seems to be that there will be a strong presumption against a hernia directly arising from an accidental injury which will not be overcome by merely showing that hernia is coincidental with some exceptional exertion. Decisions respecting hernia are by no means harmonious. The Oregon Commission requires hernia claimants to provide affidavits establishing the non-existence of hernia before the accident. The Washington Commission requires proof that hernia is of recent origin, is accompanied by pain, was immediately preceded by an accidental strain and did not previously exist. The Nevada Commission has likewise adopted strict definite rules.

"**Disfigurement.**—Injuries causing mutilation or disfigurement accompanied by disability to pursue the previous or other occupation have received considerable legislative and judicial attention. Nine states have made statutory provisions confined as a rule, however, to compensation for mutilation of the head or features. The acts of Vermont and Kentucky require that for the purpose of compensation mutilation must cause lessened capacity to secure employment. The Iowa Commission in the absence of a statutory provision held it would allow compensation only if it could be shown that the working capacity was affected. The New York courts share this view, that of Illinois modifies it.

"**Occupational Disease as an Accident.**—In Great Britain certain forms of occupational disease resulting from infection, like anthrax, were held to be a 'personal injury by accident.' By later legislation all occupational disease is defined in a separate statute to which additions are made by order of the Secretary of State. In our own legislation there is now a marked tendency to require separate provision for such disease and to deny it compensation as an 'accident.' The Supreme Courts of Connecticut, Michigan, and Ohio, have held their respective acts do not include occupational disease, although the term 'injury' and not 'accident' qualifies the statute of each of these states. The Supreme Court of Massachusetts, on the contrary, has held that the term 'personal injury' includes occupational disease. The construction and practice of administrative commissions indicates an increasing tendency to allow compensation for many forms of disease contracted during employment without requiring a clear proximate relation thereto to be established."

The litigation of claims in the past (still existant in several states), involving as it did, the employment of lawyers by both sides, the hiring of expert medical witnesses and the expense to the state of providing judge and jury was one of the most wasteful practices in the industrial world. The poor employee, who is entitled to some

compensation for his injuries and who found it necessary to fight his case through a bewildering maze of technicalities, usually came out at the little end of the horn after paying his lawyer and his witnesses their portion of the settlement. As a general rule the various compensation acts have eliminated this wasteful practice to a large extent but in many cases the injured employee still consults his lawyer and the latter pleads his case before the Compensation Commissions. It is fortunate that in some states the findings of the Industrial Commission can be refuted by the courts and even a jury may make the final decision in the case. It would seem desirable to eliminate both lawyers and expert witnesses as far as possible before the Industrial Commissions, reserving this for the few cases which must be referred to the courts.

The members of the Industrial Commission are not lawyers as a rule and they are often easily bewildered by the legal phraseology or technicalities injected into their hearings by the legal profession. The employer can often afford to engage the services of a good lawyer and the employee, therefore, feels compelled to have a legal representative, often of an inferior grade. If a medical expert is secured by the one, the other feels compelled to procure his expert. As a result a full-fledged trial with its accompanying expense to both sides is conducted before a lay board.

In order to completely obviate this needless expense and to assure the full amount of the settlement to the employee without deducting fees for legal and medical experts, these commissions should act purely as referees between the claimant and defendant and when either legal or medical professional advice is needed they should obtain it from disinterested representative members of these professions. An equitable settlement could thus be arrived at in the majority of cases; only a small minority would need to be referred to the courts.

The employment of medical staffs by many industrial commissions is now taking place. This practice will undoubtedly extend to all the commissions in the course of time. More than half the claims appearing before Industrial Boards involve the question of the extent of the disability. When the plant physician claims that the disability is temporary or that only 25 per cent. of the function is lost in an injured member and the employee or his physician claim that the disability is permanent or at least 50 per cent. of the function is lost, one of the expert medical men on the staff of the Commission can examine the case and often arrive at a definite solution of the question of disability. When necessary, these medical men are empowered to employ consultants who likewise are disinterested parties. The testimony, therefore, of these consultants and their own doctor form the basis of settlement for the Commission.

In order for such a plan to successfully operate the Industrial Boards are realizing more and more the importance of employing the very best surgical talent of the community on their medical staffs. As stated by Mr. Andrus, these medical men on the Commission can influence employers to use only the best surgeons in their accident work. If a surgeon is constantly obtaining poor functional results in his cases and then appears before the Industrial Commission endeavoring to camouflage his mistakes by belittling the employees' disability, both the Commissioners and their doctors soon recognize the facts and are in a position to point out to the employer the reasons for the high compensation claims he is forced to pay.

Another advance in the administration of these compensation acts is seen in the increased interest which the various industrial com-

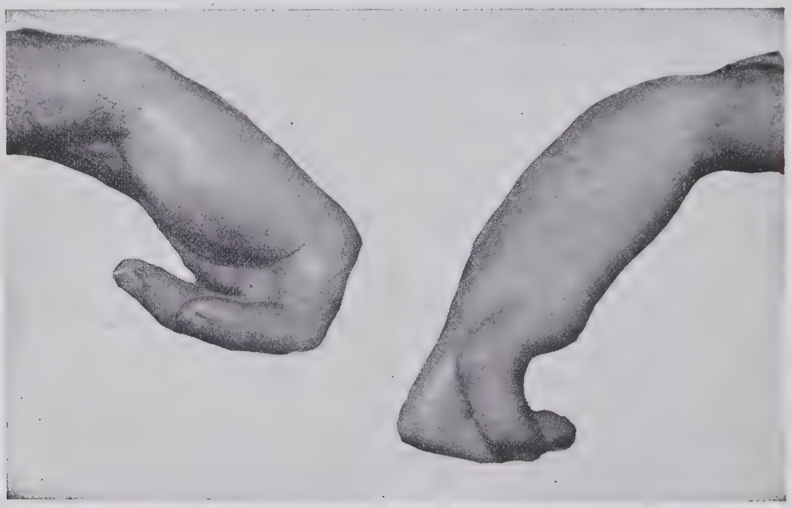

FIG. 195.—This patient who lost parts of both hands and sustained total functional disability from electrical burns has been fitted with artificial appliances and is receiving practical vocational training for a better job in the industry where he was injured. He was awarded total disability benefit. Compensation alone, however, would not assure his future.

missions are taking in the re-employment or the rehabilitation of these injured employees. In this connection they are demanding better functional results from the surgical treatment given and they are insisting upon the re-employment of disabled men in occupations where their remaining functions can be used to the utmost. The California Commission "feels that the Workmen's Compensation, Insurance and Safety Act places an obligation on it which is not specifically defined in the text of the law." That is, it feels responsible for the surgical results to the injured working men coming under its care. It feels that besides scrutinizing results from the standpoint of indemnities deserved,

it should scrutinize them from the standpoint of good surgery and surgery which might have been accorded. Again we find this broader interpretation of the duties imposed upon the Industrial Commission in the following remarks made by the Chairman of the Illinois Industrial Commission: "It frequently happens that a laboring man has an arm amputated and honestly considers that there is nothing further that he can do and that his usefulness is forever gone. The state has not done its duty to this man by merely paying him his compensation, which is soon gone. He should be trained for other work. The treatment is mental as well as physical and should be a part of the work of the medical department. Such a man should be definitely trained for some other line of work in which he may be made a 100 per cent. man. I lay emphasis upon this 100 per cent. man as that is the aim of the rehabilitation."

From the above résumé of the various compensation acts and the tendency of the different commissions responsible for their administration to extend their duties along humanitarian lines it is evident that the surgeon in industry must have a close relationship to these commissions. The surgeon must realize that dependent upon the results of his work many things are at stake. For instance, to a large extent he can control the amount of temporary or permanent disability which the injured employee must sustain; he can influence the amount of compensation which the employer must pay; he can directly increase or decrease the expenses of the state government by the character of his service. The character of his work is not gauged by the surgical results only but must deal likewise with the mental attitude of the patient. By kindness, tact and justice the surgeon can settle many a claim, which would otherwise come before the industrial commission. Thus many a surgeon in industry has entered a field of socialized medicine without knowing it. Industrial commissions are recognizing the doctor's value in this work. "The character of the medical service rendered to the individuals who have been injured determines to a larger extent than would appear on the surface, the length of disability. The question is not only one of recovery from the injury with the least possible deformity; it goes further than this. It involves the restoration to full function which often depends upon complex psychic conditions. The function of the surgeon is more than mechanical. He must be the physician and he must be in sympathy with his patient. He must treat him as his mental endowment and as his mental attitude require." (Industrial Accident Commission of California.)

Further proof of the doctor's importance in this field is seen in the following words from the same Commission: "The more personal the touch between the doctor and his patient the more confidence will be

established and the better and quicker will be the result. The same theory applies equally well to the relation between the State Compensation Fund and the doctors."

The very fact that more claims for settlements come from those groups of employees dependent upon insurance companies for their settlements and their medical service is due to the lack of this personal interest of the doctor in his patient. Too many insurance companies employ cheap medical service and have an insufficient number of doctors to adequately care for the employees under them. These conditions plus the endeavor of the company to secure the cheapest possible settlement causes dissatisfaction among the injured and leads to injustice and misunderstanding for both parties. The injured employee, worried by bickering, is more liable to develop neuroses, especially neurasthenia. Thus, added to the increased number of cases requiring settlement are those cases which develop prolonged disability. Both of these groups could be reduced by better medical care and by establishing the personal contact between the employer, the doctor and the patient.

There are several things which the surgeon in industry must do which have a direct bearing upon his relationship to compensation:

1. He must consider every case as serious from its inception. Even the minor cases must be recognized as potential major conditions. Only in this way can a careless, temporizing method of treatment be avoided. This implies immediate emergency treatment for all injuries.

2. The surgeon responsible for the complete care of the case should take charge as soon as possible, preferably he should render the emergency treatment. He should carefully supervise all the details connected with the care of the patient and should not leave important dressings or other vital matters connected with the treatment to the internes or assistants. In no other way can he keep the patient absolutely satisfied, a most essential factor in all personal injury cases.

3. Rough handling of injured employees, gruffness, an unsympathetic manner of approach, or treating them as though they were "charity cases" will not reduce the number of compensable cases. Gentleness, cheerfulness and a sympathetic attitude are the essential attributes of the good accident surgeon. Dissatisfaction among the injured increases the amount of compensation. It leads to various types of neuroses; it delays recovery; and it robs the surgeon of the opportunity of hastening the return to work. The patient may complain of the hospital food or of mistreatment on the part of the nurse or interne, or other imaginary or real abuses. The surgeon should promptly note these signs of discontent, diplomatically learn the details from the patient and run down every complaint to its source with the view to correcting the same. A lack of interest in the patient's

comfort is a frequent fault with surgeons. The patient may object to being placed in a ward and may demand a private room in the hospital. Usually the surgeon can remove such objections by a little patient diplomacy but occasionally he will find that he can decrease the compensation by yielding to the patient's or the family's desire. Often a private room and other luxuries which may have to be included in the treatment are cheaper than a dissatisfied patient.

Fig. 196.—An armless soldier learning to use his artificial appliance and at the same time receiving instruction in a new trade, acetylene welding.

4. The best emergency treatment, constant watchfulness for complications and continuous active treatment until cure is accomplished will give the desired surgical end-result. But, in the words of one of our Army Medical Officers, "surgeons must free themselves from their tendency to treat the wounds and forget the function; to make a well man but not a working one; to take the anatomic

rather than the physiologic point of view." In accident surgery the physiologic is the economical point of view. In order to attain this functional result the injured must be encouraged to early use the injured member in spite of the temporary pain and discomfort such use may occasion. It is often desirable to remove the patient from the environment of the hospital as soon as possible even though it may inconvenience the surgeon to a certain extent. Again recovery may be hastened and a workable functional result obtained more quickly by getting the injured party back in the industry on some light work even though it is for part of the day only. The injured party may refuse to consent to this therapeutic use of light work on the grounds that to return to work means the loss of further compensation. The surgeon must persuade the management to pay such employees their full wages from the time they return to this light occupation, even though the man is not earning them; pointing out that in this way his recovery is hastened and compensation for permanent disability often avoided.

5. Honesty and justice must be the controlling motives of the surgeon in deciding the points relative to compensation. He cannot afford to take the side of the employer as opposed to the employee nor vice versa. However, both the employer and the surgeon will find that a generous policy toward injured employees is more economical in the long run. In the concern with which the author was connected the slogan of the management was "Give the employees the benefit of the doubt." Industry in the past has had many company doctors but these are gradually being replaced by the employees' doctors. Any surgeon who regards the interest of the employees will best be serving the interests of the company. This is the attitude, therefore, which should be adopted in claims for compensation.

6. When the surgeon is called before the industrial commission or before the court to testify in cases claiming settlements he must be guided by this same policy of honesty and justice. All the information which he can give which will assist the court in arriving at an equitable adjustment of the case should be given. The withholding of valuable information in order to protect the industry employing the surgeon is a short sighted policy. It is a mistaken type of loyalty and no doctor can expect to retain the respect of the management or the confidence of the employees by adopting such a method.

7. Frequently the family physicians are responsible for many of the claims for compensation. A snap-shot diagnosis of a broken bone, a dislocated vertebra, a displaced uterus, internal injuries and like conditions, when they do not exist will give the injured party an exalted idea as to the extent of his injury and cause him to make excessive claims for damages. Realizing this human trait, all doctors

should be very conscientious in making their diagnoses and very guarded in the statements which they make to the injured person. Many of the traumatic neuroses, with their prevailing disability and their needless compensation result purely from these false notions gained from the exaggerated statements of doctors.

Many surgeons with wide experience in handling these accident cases feel very strongly that some of the principles of the compensation acts are wrong. For instance, the waiting period will often cause an employee to prolong his disability in order to receive compensation.

The provision that a pre-existing disability will add to the employer's responsibility in case of subsequent accident is wrong because it tends to make employers discriminate against those applicants for work, and even the old employees, who are unfortunate enough to possess some handicap. To-day many employers refuse to hire a man blind in one eye because they will be held responsible for total blindness in case of loss of the other eye. The amount of weekly compensation provided by the majority of the laws for the injured party is inadequate. Many employees are injured, not through their own carelessness, but because the industry has failed to provide the proper preventive measures. Nevertheless, this employee is forced to lose his total wage for at least one week and then to receive only a portion of his wages over a period lasting several weeks. He may have a large family and his earnings have hardly been sufficient to provide the necessities of life. After he is injured, hardships and distress are placed upon the family because of the reduced amount of money paid to him. The worry and dissatisfaction engendered in the patient's mind because of these conditions prolong his disability. Surgeons in industry are witnessing this almost every day and the various legislatures should certainly provide some more equitable arrangement.

With the return of the disabled soldiers from the present war the problems confronting the plant surgeon will be greatly increased. After the sense of gratitude and the present patriotic fervor have quieted down, many employers may refuse to hire these disabled men because of the possible increased insurance rate or the increased amount of compensation which may result. At present, there is a strong feeling that present compensation acts must be amended so that employers will not be held responsible for the pre-existing disabilities. A Federal law may be necessary, establishing a fund for the purpose of compensating that portion of the disability which is traceable to the employee's service in the army. That some arrangement is necessary to meet this problem is agreed by all cognizant with the situation.

The surgeon, therefore, dealing with these returned soldiers will

often be confronted with the problem of whether the man's disability is due entirely to some condition connected with his work, whether his disability following an accident is made worse because of some pre-existing war condition or whether the disability is only the recurrence of some condition the result of his army service. Much of the supervision of the health and subsequent physical condition of these returned soldiers will devolve upon the surgeon in industry and he must be awake to the situation. In this connection it is of considerable interest to know how the European countries are meeting these problems relative to workmen's compensation in relation to the soldier.

In Germany the director of the Imperial Insurance Office in February, 1915, said, "cripples who enter industry after discharge from the army will increase the dangers coincident to a trade. Owing to their slower movements they are more liable to danger. They also increase the danger to their healthy fellow workers. The number of accidents and the burden of compensation, will, therefore, be immensely increased." The remedy proposed in Germany is not a change in the insurance law but rather a development of the therapeutic facilities already in operation by the accident insurance associations. The hospitals of these associations have specialized in the rehabilitation and training of cripples. It was decided to give 5 per cent. of the fund, of each State Insurance Office for the erection of hospitals where these crippled soldiers could be rehabilitated and trained for special employment. By this method it was believed that these cripples could be made as good a risk as a sound man. After his employment, if a disabled soldier receives an accident he is entitled to compensation under the insurance law even though he is receiving a military allowance for the pre-existing disability. The matter of re-employing former workmen who have been crippled in the war has been made a patriotic issue in Germany. Although employment means insurance, employers have shown great readiness to accept the responsibility. The Frederick Krupp Corporation, not only provides employment for such men but gives them vocational training in a special workshop to fit them for a place where they can safely work.

In France this problem of the returned disabled soldier in industry has already been met by an act known as the Law of November 25, 1916.

"This law provides, that when a person suffering a disability received in the present war meets with an industrial accident, the court which fixes the amount of compensation due him shall state, first, whether the accident was caused by his previous disability, and, second, to what extent the permanent reduction of his earning capacity following the accident was due to his disability. If the court

finds that the accident was caused exclusively by the pre-existing disability (received in the war), the employer shall be absolved from all obligations to pay any part of the allotted compensation; and if the court finds that the reduction of the workmen's earning capacity after an accident was due in part to his previous disability, the employer shall not be required to pay the whole compensation, but only that part which corresponds to the actual consequences of the accident. The compensation from which the employer is thus absolved shall be paid to the workman by the state through the *Caisse national des restraites pour la viellesse,* which shall receive the money from a special benefit fund[1] created for that purpose. The special benefit fund shall be supported by a tax on employers and insurance companies. A translation of the text of the law follows:

"'A Law concerning Persons Disabled in the War, who later become the victims of Industrial Accidents. Passed by the Senate and Chamber of Deputies, and promulgated by the President of the Republic.

"'Article I. Whenever a soldier, a sailor, or non-combatant attached to the army, suffering serious and incurable disabilities as a result either of wounds received in the course of war or while in government service during the present war, or as a result of sickness contracted or aggravated by the fatigues or dangers of service during the present war, shall be a victim of an industrial accident under conditions provided for by the laws of April 9, 1898, June 30, 1899, April 12, 1906, July 18, 1907 and July 15, 1914, the decree of the president of the court or the judgment of the court which fixes the amount of compensation for his death or for the permanent reduction of his capacity for work must expressly state its findings with reference to the following points:

"'1. Whether the accident was caused exclusively by the pre-existing disability resulting from the war.

"'2. Whether the permanent reduction of capacity resulting from the accident was increased by said disability, and to what extent.

"'In reference to Point 1, an affirmative decision of the court shall absolve the industrial concern from all obligation to pay any part of the compensation allotted to the victim by the decree or judgment; in reference to Point 2, when the court has decided to what extent the permanent reduction of the worker's capacity resulting from the accident was increased by the pre-existing disability.

"'The compensation from which the employer is thus absolved shall be paid by the National Pension Fund for Aged People,[2] which shall receive the money from a special Benefit Fund for men wounded in

[1] Fonds spécial de prévoyance des blessés de la guerre.

[2] Caisse national des retraites pour la vieillesse.

the war.[1] The activities of the special benefit fund shall be directed by the ministry of labor,[2] and its finances by the Fund of Deposits and Consignments.[3]

"'The special Benefit Fund shall be supported by assessments on employers and insurance companies, the rate of which assessments shall be fixed each year by the finance law[4] according to the circumstances indicated in article 25 of the law of April 9, 1898, in articles 4 and 5 of the law of April 12, 1906, modified by the law of March 26, 1908, in article 4 of the law of July 18, 1914, concerning the different classes of employers; and in article 27, last paragraph, of the law of April 9, 1898, modified by that of March 31, 1905, concerning insurance companies.

"'Article II. A decree issued after consultation with the Advisory Committee of the Industrial Accident Insurance Companies shall determine the organization and activities of the special Benefit Fund mentioned in the preceding article. The counsel for the controller of private insurance companies shall be a member of said Advisory Committee by virtue of his office.

"'Article III. Temporarily, for the years 1916, 1917 and 1918, the assessments collected from industrial concerns and insurance companies in the application of the preceding provisions of the law shall be equal to a third of the assessments provided by the following laws:

"'1. The decree of May 28, 1915, concerning factory licenses and operators;

"'2. The law of December 13, 1912, concerning the application of paragraphs 2 and 3 of article 5 of the law of April 12, 1906;

"'3. The decree of the ministry of labor fixing the cost of regulation and supervision of insurance companies for the year 1913.

"'Article IV. After the accounts of the special Benefit Fund for men wounded in the war have been fully audited, whatever sum may be left shall be deposited with the Guaranty Fund,[5] established in connection with industrial accidents by article 24 of the law of April 9, 1898. Paris, November 25, 1916.'

"A somewhat earlier law, passed April 17, 1916, is not concerned with compensation for accidents but with reserving certain positions for disabled soldiers. It provides that a number of government positions hitherto reserved for non-commissioned officers with a certain length of service, shall during five years after the cessation of the war be open to disabled soldiers of all ranks irrespective of length of ser-

[1] Fonds spécial de prévoyance des blessés de la guerre.

[2] Ministre du travail at de la prévoyance sociale.

[3] Caisse des dépôts et consignations.

[4] Loi des finances.

[5] Fonds de garantie.

vice, preference being given to men with large families; and that in the future no manufacturing or business concern shall obtain a concession, monopoly, or subvention from the State, department, or commune unless it reserves a certain number of positions to disabled soldiers. With regard to this law, Dr. Bourrillon, the head of the great re-educational center at Saint-Maurice, says that when reserved positions are granted to disabled soldiers preference should be shown the most severely wounded, and such positions should not be given to men still capable of entering industry."

Other laws have been proposed but have not been passed, namely:

1. A law making vocational re-education compulsory;

2. A law making it obligatory on employees of any number of workmen above a prescribed minimum to employ a certain proportion of disabled soldiers;

3. A law giving to disabled soldiers the means of acquiring a piece of land.

Workmen's compensation and other forms of social insurance are still in their infancy in this country. Undoubtedly many amendments to the existing laws and the enactment of new ones will follow in the wake of the social democracy which is developing as a result of this war. The surgeon in industry because of his knowledge gained from actual experience in handling these problems must play an important part in moulding these changes.

CHAPTER XLII

COMPENSABLE HERNIA

The condition known as traumatic hernia is strongly denied by some and just as forcibly affirmed by others. Few subjects connected with industrial surgery have caused greater discussions among surgeons especially since the enactment of employees compensation laws in this country. In Germany and England the passage of compensation laws created similar discussions. It seems that following the creation of these employees compensation acts claims for traumatic hernias have greatly increased both in Europe and in this country. Some of the best surgeons have used this fact to try and prove that: (1) Industrial compensation commissions are biased in favor of the employee and are rendering erroneous and unjust claims when they grant compensation for this condition; (2) that employees are intentionally making fraudulent claims when they swear that their hernias were due to accident or extreme effort; (3) that surgeons who claim that hernia can result from trauma or severe efforts are unscientific and differ from the "decisions of established medicine."

Surgeons who hold the above views seem to forget that these decisions of established medicine date back to the precompensation days and were based on the testimony of expert authority, made in the courts of England especially, and later in our own courts, to the effect that a traumatic hernia could only occur from a direct violence resulting in a definite tearing or rupture of the abdominal wall. All other hernias were claimed to be due to congenital defects, preformed sacs, and were similar to all other diseases which might occur coincidental with occupation but not related to it. Such testimony was sustained by practically every court and their views were considered as the decisions of established medicine. Any surgeon holding a different view was unorthodox. It was useless for an employee to seek compensation for his hernia the result of occupation when these legal and medical forces were aligned against him. Naturally few claims for traumatic hernia were made, although employees in those days, just as frequently blamed their work for the condition as at the present time.

A new viewpoint began to permeate industry during the first ten years of the present century. It was characterized by greater consideration of the rights of the working man by his employer, a more humane attitude, which took into account certain moral responsi-

bilities not included in the purely legal obligations. No greater proof of this change could be furnished than the passing of the old-time company doctor, who constantly favored the legal rights of his employer as opposed to the moral rights of the employee, and his replacement by the medical staffs, maintained by many of our best and largest industries, whose duties consist of health supervision, prevention and the best medical and surgical care of the employees. No laws have forced these changes; the pioneer systems of industrial medicine were established before the enactment of compensation laws.

This new attitude on the part of industry is exemplified by many other changes. Some of the leading concerns organized mutual benefit associations in order that employees might receive at least a portion of their pay during a period of disability; group insurance was inaugurated by others providing insurance against death; many began to carry their own accident insurance realizing that thereby more equitable compensation would be granted to their injured employees; some of these paid full wages during disability, and a generous compensation in case of injury, although legally only two-thirds of the wages were required. Most of these concerns adopted the policy of "give the employee the benefit of the doubt." Whenever an accident occurred, if there was any moral responsibility attached, even though legally they might side-step the laws, compensation and free surgical care were given.

This policy soon extended to diseases. When a disease occurred which might be traceable to some occupational cause, free medical service and compensation were furnished, although very few state laws included occupational diseases among the compensable conditions. Certainly no responsibility existed for the majority of cases of bad teeth or poor eyesight and yet several industries furnished free dental care and oculist services to their people.

The question of legal rights did not enter into the plans of these industries. They recognized certain moral obligations and in addition realized that it was good business to improve the conditions of their employees and thereby make them more useful and efficient.

Among such broad-minded employers the question of whether there was such a thing as traumatic hernia, for which they could be held legally responsible, did not cause much concern. They were not governed by the decisions of established medicine nor of established law but based their decisions upon a just and good business sense.

If they employed a man with a hernia they knew the industry was not responsible for it. If it grew gradually worse without any definite accident or excessive occupational effort it was due to natural causes and again they were not responsible. But if as a result of accident or severe strain this hernia became strangulated, at once doubt as to responsibility entered the case and the decision was, therefore,

rendered in favor of the employee. If they hired a man who showed no sign of rupture at his employment examination, but who later suffered an accident or a severe occupational strain and as a result the hernia appeared, compensation and free surgical care were given because in the man's mind the accident caused the trouble, and because they recognized that to a certain extent the occupation was contributory to the final development of the condition.

From the standpoint of efficiency it was found that a man with hernia was about 25 per cent. less efficient than the man without one. Therefore, these concerns might refuse to employ men with a rupture but they became more and more liberal regarding the repair of such a condition when it developed in an old employee.

Such was the attitude of several concerns at the time of the passage of the employees, compensation acts. In fact these very laws were an expression of this new humane influence which had entered industry. The administration of these acts was placed in the hands of industrial commissions whose members were laymen rather than lawyers. Influenced by the generous attitude of certain industries, and guided by this sentiment and a consideration of moral rights, combined with their meagre legal knowledge, the decisions of these various commissions were often at variance to those rendered by the courts in the past.

Thus employees began to seek compensation for many conditions which heretofore had not been considered compensable, and included among these were hernias which developed during employment.

The honest employee who claimed that his hernia, which appeared shortly after an accident and was, therefore, in his mind due to the same, was not seeking fraudulent compensation. The industrial commission which granted his claim was governed only by a spirit of square dealing. The surgeon who recognized the pre-existing congenital defect, or the preformed sac, and yet testified that the accident must have been a contributing factor in the final development of the hernia, was not unscientific or unorthodox.

The question of traumatic hernia, therefore, simmers down to three considerations:

1. A proper definition of what is meant by traumatic hernia;

2. To what extent must an accident or an occupational hazard which only partially contributes to the development of a condition be held responsible for the same;

3. In which cases should compensation be paid by the employer.

The term "traumatic hernia" as used by most authorities covers only a small percentage of the compensable cases. These authorities consider only those hernias which develop immediately following a direct violence to the abdominal wall as true traumatic hernias. Some

claim that this violence must result in a tearing or rupture of the soft tissues thus allowing some portion of the abdominal viscera to protrude. Others state that the violence must be sufficiently severe as to give signs of ecchymosis and swelling with the appearance of the hernias. Practically all surgeons agree that hernias the result of such violence are very rare. Therefore, if we adopt this definition of traumatic hernia and grant compensation only to this type of case, we have practically removed the problem from the realm of discussion.

However, some of our best authorities such as Coley, Plummer, Colcord, and several others add to the above definition of traumatic hernia by including those cases which result from the indirect application of force causing greatly increased intra-abdominal pressure. Thus Coley says: "We would define traumatic hernia as a hernia resulting from the direct application of force to that portion of the abdominal wall at which the hernia appears, or a hernia resulting from the indirect application of force causing greatly increased intra-abdominal pressure. Whether the hernia follows the natural openings in the abdomen, inguinal or crural canals, or creates a new passageway is immaterial." Therefore, if we adopt this broader definition of traumatic hernia we at once admit many additional hernias to the compensable class.

The amount of violence or force necessary to produce a traumatic hernia as above defined is another important factor in our definition. Some surgeons claim that a violence or force sufficient to produce a hernia will also produce tearing of the soft tissues, ecchymosis and swelling; such signs may not always appear externally but will certainly be found on operation, evidenced by a reddened, inflamed peritoneum and swollen soft parts. Other surgeons agree that a hernia the result of direct violence will show these signs of injury while other hernias due to increased intra-abdominal pressure may not develop signs of a recent trauma but will always give symptoms such as pain and tenderness followed immediately or within a few hours by the appearance of the rupture. The English Court of Appeals and several of our industrial boards, especially Illinois, Wisconsin, Michigan and New York, have ruled that "where a strain causes a protrusion of the bowels it is a compensable injury, even though the protrusion is at a point weakened by congenital malformation or pre-existing hernia."

Therefore, it is quite evident that the question of the degree of violence and force necessary to produce "traumatic hernia" is the real bone of contention. If we accept the view of many excellent surgeons that traumatic hernia can only result from direct violence to the abdominal wall, we then eliminate many hernias which are being compensated to-day. If we include in the above class those hernias which result from increased intra-abdominal pressure due only to

indirect application of force to the abdominal wall, we extend compensation to a greater number of hernias and at once begin to confuse the issue. If we still further include in our list of traumatic hernias all those which develop from other forms of indirect application of force, such as a sudden strain causing greatly increased abdominal pressure, we have admitted still a larger group to the compensable class. And finally if we agree with those legal opinions which include all hernias developing as a result of strain, without defining the degree of strain, then we have thrown the gates wide open and will pay compensation to a large percentage of all hernias which develop.

Those surgeons who claim that only the true traumatic hernia is compensable do a great injustice to many employees. Those industrial commissions which claim that all hernias developing as a result of "strain" are compensable, do a great injustice to the employers. Both views are responsible for many of the fraudulent claims made for compensation by dishonest employees.

Traumatic hernia is a misnomer as it indicates the very small group of hernias resulting from direct violence. Other types of hernia develop for which the occupation is more or less responsible and are described by Lotheissem and other German writers as "accidental hernia."

I wish to adovcate, therefore, that the term "compensable hernia" be adopted in this country by both the medical and legal professions; and further, that this term shall include all cases of true "traumatic hernia" and all cases of "accidental hernia" in which the force causing their development is directly the result of some *unnatural* occupational hazard.

Under this definition, the following would be compensable hernias:

1. True Traumatic Hernia.—(*a*) As a result of direct violence all parts of the hernia show signs of being recently formed. Such a hernia develops immediately, or within a very short time after the receipt of the injury. It is accompanied with definite signs of injury to the soft tissues at the point where the hernia appears.

Example.—Man struck in the right groin by the sharp end of a crowbar thrown forcibly by a fellow employee. Severe bruising, and ecchymosis resulted. Patient complained of severe pain and nausea and within ten hours a definite direct inguinal hernia appeared.

(*b*) As a result of direct violence to some other portion of the abdominal wall an indirect force is established through the medium of the increased intra-abdominal pressure and causes a hernia to appear immediately or very shortly afterward, usually at one of the natural openings in the abdomen. The presence of a predisposition for hernia such as a congenital defect or a preformed sac, "is immaterial." All that is necessary to know is that the hernia did not already exist.

Such a hernia may or may not present external signs of injury at the point of development, such as ecchymosis or swelling, but practically always gives definite symptoms, such as pain, tenderness and nausea.

Example.—A boy was run over by an automobile, the wheel passing directly across the middle of his abdomen. He was immediately examined and signs of severe contusion extending completely across the abdominal wall were found. Careful examination for hernia failed to reveal any sign of this condition. Twelve hours later a small indirect left inguinal hernia, the size of a pigeon's egg, appeared and was accompanied with severe pain and tenderness. There was no sign of direct violence at this point but the indirect force was held responsible.

(*c*) As a result of direct violence to some other part of the body other than the abdomen, a hernia appears the result of the indirect application of force which causes greatly increased intra-abdominal pressure. Such a hernia appears immediately or shortly afterwards, always at one of the natural openings in the abdomen, usually the inguinal canal. Such a hernia rarely gives external signs of injury but as a rule causes the employee to complain of pain in the inguinal region and often nausea, immediately following the violence. Here again the question of predisposition to hernia is immaterial but it is essential to know whether a fully established hernia was existent or not. The burden of proof rests with the employer, hence the importance of careful physical examinations with accurate records for all employees.

Example No. 1.—A negro examined two years previously, no hernia present, was carrying a heavy desk with three other men. His partner fell thus throwing all the weight of the end of the desk on this employee. He immediately felt pain in his right inguinal region and became quite sick at his stomach. He rested for fifteen minutes and then started to work again. Three hours later while in the toilet he noticed a slight swelling in the groin and reported to the doctor's office. An examination showed a hernia within the inguinal canal and about the size of a walnut. It was tender on manipulation but could be readily reduced. There were no signs of ecchymosis or swelling of the tissues about the hernia but the former record, history of accident, immediate symptoms, and appearance of a small hernia, placed this in the compensable class.

Example No. 2.—An employee pushing a heavy, loaded truck slipped on an iron runway, causing him to fall forward, the weight of the truck adding to the force of the fall. He immediately felt a pain in the right inguinal region which increased when he attempted to again push the truck. He complained of the condition to his helper and the latter took charge of the truck. This employee finished his day's work but

"took it easy." That night while taking a bath, he noticed a small swelling in his right groin. The next morning he reported to the doctor's office. Examination showed a small indirect inguinal hernia the size of a walnut. The man's record showed that he had been examined for employment four years previously and no hernia was present. He was again thoroughly examined a year before this accident without a hernia being discovered. This record, history of the injury, and the fact that he complained to his helper placed this hernia in the compensable group.

(*d*) As a result of any of the forces described in (*a*), (*b*), or (*c*), a man known to have a hernia or who gives a history of a hernia, suffers some complication such as strangulation, incarceration or hemorrhage into the sac. While his occupation may not be responsible for the hernia, yet the accident was responsible for the complication and, therefore, is a compensable condition.

Example.—A packer with a known hernia poorly protected by a truss was helping load a heavy box on to a truck. Standing on the truck he was leaning over lifting up the box when the truck moved forward, causing the weight of the box to be suddenly thrown on the employee and he fell forward to the ground. He immediately complained that his rupture had come down and endeavored to replace it. Failing in this, he reported to the doctor's office where every effort was made to reduce the contents of the hernia but without success. The man complained of extreme pain and a short time later began to vomit. The swelling increased in size and after a few hours it was quite evident that a strangulation had developed in the hernia. An operation was performed at once and the strangulation relieved followed by the repair of the hernia.

2. **"Accidental Hernia" or "Sudden Hernia."**—This group includes those hernias which appear immediately or shortly after a slight accident occurring coincidental with severe straining; or as the result of a severe occupational strain out of all proportion to the lifting and straining of ordinary occupation.

The great majority of hernias develop slowly, "the gradual dilatation by mesentery of a preformed sac." The congenital defect or predisposition is the chief cause for such hernias and the relation of natural occupation or of the natural acts of ordinary life are immaterial in their formation. These correspond to the gradual development of "flat-foot" a result of faulty shoes, constant standing and walking or other natural causes; or to the development of tuberculosis in employees engaged in occupations which in no wise predisposed to this condition.

A small percentage of these hernias, however, make their first appearance after some unnatural occupational hazard which is out of

all proportion to these ordinary or natural conditions. These correspond to the occupational diseases which are now recognized in some states as accidental and, therefore, compensable. These are borderline cases for which no hard and fast rules can be laid down. The individual merits of each case must be carefully considered to arrive at an equitable settlement.

Example No. 1.—A young man of rather slight build who had done nothing but clerical work, sought employment in another concern. He was given a physical examination and no hernia was found. He was assigned to the dry goods department. A month later he endeavored to lift a crate containing cotton goods, and weighing about 150 pounds, on to a shelf about the height of his shoulders. He tugged and strained at the load until he finally had it in place. He immediately felt nauseated and faint and complained of pain in his lower abdomen. His foreman remonstrated with him for lifting such a heavy package and told him to rest for a while. As he continued to feel badly, the foreman finally sent him to the doctor's office. Examination showed a distinct bulging of the right inguinal canal which increased on coughing and straining and was accompanied with a definite impulse. The employee was sent home and told to report the next day. At this examination it was evident that the man was suffering from a direct inguinal hernia. All symptoms had disappeared except that he complained of a feeling of weakness in his side. This was considered a compensable hernia and as such was operated, the man receiving compensation during the period of his disability.

Example No. 2.—This employee, 46 years old, had not been previously examined and, therefore, no record as to hernial condition existed. He was engaged in unloading large rolls of paper from a car, the rolls weighing 200 pounds each. One of these rolls started to fall from the gangway and while making an extreme effort to pull it back in place, the employee fell from the gangway to the ground, a distance of five feet. No one witnessed the accident but the employee immediately reported to his foreman and told him that he had strained his side in falling. The roll of paper on the ground substantiated his statements. He was at once sent to the doctor's office. Examination failed to reveal any signs of external injury and no fully developed hernia was found although a slight impulse in the inguinal canal was obtained on coughing and straining. He was allowed to return to work, the foreman being informed to give him light employment for the rest of the day. The next morning he was again examined and on coughing and straining, a small hernia the size of an English walnut appeared at the external ring. This patient complained of a low-grade pain made worse on examination

of the hernia. He claimed that he had never been ruptured before and the general appearance of the hernia in a man with very strong abdominal muscles seemed to indicate its recent development. All surgeons will agree that a hernial sac sufficiently long to allow this hernia to appear at the external ring, must undoubtedly have been preformed. Nevertheless, the history of the unnatural occupational hazard was so definite, there were no witnesses to deny the accident, and the rapid appearance of the hernia during the period between the two examinations, all clearly indicated that this was a compensable hernia.

In the first group of compensable hernias, namely, the true "traumatic," the question of the congenital defect or predisposition is immaterial as both Coley and Colcord have so thoroughly demonstrated. In the second group, namely, the "accidental" or "sudden" hernia, the decision as to the responsibility for the condition must depend upon two causes—the pre-existing defect and the exciting contributing factor that makes the hernia appear. Every bit of evidence which can be collected in favor of one or the other of these causes must be carefully weighed before deciding whether the hernia was due to "natural" causes or whether it was due to "unnatural" causes and, therefore, compensable.

In favor of the hernia being due to natural causes, we have the following:

1. History or knowledge of a hernia already existing. This implies at once the necessity of thoroughly examining all applicants for work and all old employees, and carefully recording the presence or absence of hernia.

2. History of a hernia in childhood which was apparently cured by a truss and had not been present for several years.

3. Presence of an undescended testicle, hydrocele, or of lipomata in the inguinal canal. (Dr. Kellogg Speed in Surgery, Gynecology and Obstetrics, September, 1914, reports in 154 herniotomies, lipomata found in the canal in 47 4/10 per cent. of his cases. Plummer thinks this an important predisposing factor.)

4. Presence of hernia at some other abdominal orifice showing a tendency for this condition.

5. Weakness of the structures forming the walls of the inguinal canal. Moschcowitz lays considerable stress on this hypoplasia of the tissues as a marked predisposing factor to hernia. He considers this hypoplasia is not limited to the abdominal muscles alone but includes the mesenteric attachments. He assumes that if one or more of these structures has been weakened, either by disease or by some atrophic process thus allowing a sagging of the viscera to a lower level, this often results in hernia. He states that this is perhaps an excellent way to

account for the fact that it is not the blacksmith or hard working laborer who most frequently acquires a hernia, but the ill-nourished man of sedentary habits. The experience of most industrial surgeons refutes this last statement however. Scherechewsky found in the examination of 1200 steel workers that ten per cent. had hernias, whereas only three per cent. of the male garment workers he examined were thus afflicted. Nathan Jones found approximately ten per cent. of hernias among the employees he examined, most of whom were engaged in very heavy occupations; whereas the author found only two and six-tenths per cent. of the employees he examined had hernias and sixty per cent. of this group were engaged in sedentary or light occupations.

6. A large external inguinal ring is given by most authorities as evidence of a predisposition to hernia. Colcord states, however, that he examined 6000 men, taking great care to examine the condition of the external and internal ring of the inguinal canal. He found 500 cases of open rings among these 6000 men. Twenty-five cases of hernia developed in this entire group but not one of those 25 hernias occurred among those with recorded open rings. He states "not one of the 500 cases of open rings has, to my knowledge, developed a hernia." Plummer, Lauffer, Hopkins and others place great stress upon this enlarged ring. On the other hand, I have operated on 160 cases of hernia which were not present at the time of examination for employment. Large rings were recorded when present in each case although they were considered immaterial. A man either had a hernia or he did not have it; the presence of a large ring was not considered evidence of a potential hernia. In fact, the large ring enabled us to make a better and more thorough examination of the inguinal canal. In the 160 operations only one of the cases showed a recorded large external ring at the time of employment. I have never been able to definitely diagnose a large internal ring without finding a hernia present. Of greater importance is the bulging of the inguinal canal between the internal and external rings showing a predisposition to direct inguinal hernia.

7. A family history of hernia is a strong etiologic factor in favor of the employee being congenitally predisposed to the condition. I have found several employees claiming that their hernias had developed as a result of lifting or some other strain. On examination, fairly well developed hernias were found. On careful questioning it was learned that the father, grandfather, one or two uncles and a brother all had hernias. This family history combined with the absence of a definite unnatural causative agent forced the decision that such hernias were due to natural causes.

8. The age of the patient is an important factor in determining the natural or unnatural cause of the hernia. Berger in an analysis of

10,000 cases showed that the highest hernia rate occurred during the first five years of life due almost entirely to congenital defects. From five to thirty years of age there is a rapid fall in the hernia rate. It then begins to increase reaching its second highest rate at the age of fifty-five. From fifty-five to seventy, hernias are common although less than one-half as frequent as in childhood. Therefore, a hernia occurring in children can usually be traced to natural causes; and when occurring in the old they are likewise most probably due to natural causes, chiefly hypoplastic condition of the tissues due to senility. Hopkins has pointed out that hernias are very common among foreigners especially the Greeks and the Southern Italians. It is well known that these foreigners develop a premature senility which undoubtedly accounts for the upward curve in the hernia rate from ages thirty to fifty-five. Colcord accounts for these by the condition which he describes as presenility and believes that continued hard labor, plus excesses in drink, plus poor food, plus bad hygienic conditions, all contribute to the weakening of the abdominal walls. These conditions with heredity and such diseases as tuberculosis and syphilis bring on the presenility condition.

9. Other etiologic factors, such as recent debilitating diseases, bronchitis, prolonged constipation, faulty posture, visceroptosis, etc., must have considerable weight in favor of natural causes for the hernia. Lauffer says that the exciting factor in hernia is some oft-repeated increase in the intra-abdominal tension and that inguinal hernias are always due to anatomic defects, plus these exciting factors except only in those hernias which develop at the point where direct traumatizing force has been applied. He designates only those due to direct violence as traumatic hernia, and calls all others "latent hernia" due to these natural causes.

10. Certain conditions found on examination of the hernia would indicate that it was due to natural causes. For example, a large hernia indicates its pre-existence; a discoloration or deep depression of the skin over the hernia indicates that a truss has been worn and, therefore, a hernia must have existed.

11. Conditions found at the operation will often indicate that the hernia was of long standing and, therefore, not due to the alleged injury, for instance, a thickened well-formed peritoneal sac, adherent mesentery or intestine within the sac, two or three sacs, the "pantaloon hernia," and other such signs of an old condition. C. H. Mayo says that heavy fibrous bands found in the hernial sac is positive proof of a long standing condition.

In favor of the hernia being due to "unnatural causes," we have the following:

1. Definite proof that the hernia did not exist previously. Such

proof may be obtained from the records of the employee's previous examination, or may be sworn to by his family physician or relatives. Frequently a life insurance examination may be referred to as proof of the non-existence of the hernia if examination of the insurance record fails to show any hernia recorded. All insurance examinations should, therefore, be made very thoroughly and should be considered as possible medicolegal evidence later on. The burden of proof of a pre-existing hernia rests with the employer.

2. A definite history of an accident occurring coincidental with straining or of a severe effort far in excess of that which the man's muscular development, stature or past experience in the occupation should call for. Such factors would compose the unnatural occupational hazards as opposed to the natural strains of his ordinary work.

3. The appearance of the hernia immediately, or very shortly, after the occurrence of one of these unnatural exciting causes. This sudden appearance is usually evidenced by the employee complaining of pain, reporting the condition at once to one or more fellow employees and seeking medical attention very shortly afterward.

4. The examination of the hernia revealing that it is of small size, seldom as large as an egg, usually within the canal or just appearing at the external opening. Recently formed compensable hernias are never of large size no matter at what abdominal orifice they appear, except rarely in the true traumatic type. Real pain and tenderness on examination are usually complained of by the patient.

5. At operation the peritoneal sac is small, very thin, and seldom protrudes the entire length of the canal. Adhesions of the mesentery or viscera to the sac are never present. Old hernial sacs are dense, give a characteristic pearly appearance and are often difficult to peal away form the spermatic chord and vessels, whereas the recent sac gives a less characteristic pearly appearance and can be readily freed from the chord. In direct inguinal hernia a definite sac may not be formed, the peritoneum simply bulging into the weak spot. Repair of these hernias can often be made without opening the peritoneum.

6. The final decision as to whether a given hernia is compensable or not often must depend upon the findings at the operation. If the hernial sac and contents show these signs of recent development weight must be given to the employee's claim. On the other hand if an old adherent sac is found, it is positive proof of the pre-existence of the hernia.

Dr. A. I. Boufflеur, *Railway Surgical Journal*, 1913, vol. xx, page 421, gives an excellent discussion on traumatic hernia. He states: "Those who have operated on many hernias within a short time after their discovery, have found that the patient's history as to when the hernia was produced is of absolutely no value, in that, when you examine

one which the patient states occurred only the day before you will find a large patent canal, a thickened and old peritoneal surface that shows that it has existed for months and perhaps years. Whereas, in another instance you will find that there is evidence of recent injury to the peritoneal tissue.

"Surgeons employed by the Northwestern Hospital Association have decided to make the following arrangements with the employees:

"'If upon examination at operation we find that the hernia is of congenital type or the tissues have the appearance of rupture having existed for a long time, you will pay for it; if the condition has the appearance of being of recent origin then the Association will stand the expense.'

"So our experience of this problem which is the same as that of the Northern Pacific, where similar conditions exist, is that a hernia which appears shortly after a man enters the service and becomes entitled to benefit must have some definite evidences of being of recent occurrence, such as localized pain or nausea, with local evidence of trauma appearing within the week, or upon operation there must be evidence of recent rupture."

An entirely different view is expressed by Dr. John J. Moorhead in the Second Bulletin of the Transactions of American Association of Industrial Physicians and Surgeons. He bases his conclusions on an analysis of the operative findings in 150 cases of so-called traumatic inguinal hernia and states: "These operative findings then, confirm the opinion that so-called traumatic hernia subjected to the critical test of biopsy or anatomic dissection resembles in all details hernias acquired in the ordinary way.

"This survey also indicates that injury is but rarely an aggravating factor, and an operator in the absence of a history of traumatism, would be unable to tell from the findings in the vast majority of cases whether or not trauma featured in any way."

Dr. Moorhead states that "without a weak canal and rings at birth, no hernia will subsequently form unless rings and canal are torn asunder or weakened by some external or internal mechanism. There is from birth an empty sac awaiting contents, and this sac being continuous with that larger sac in the abdomen, will sooner or later seek an occupant." Such a sac is "an invitation for a resident by virtue of its empty loneliness." It is inconceivable to me that such a sac will remain completely empty during the tree climbing days of boyhood and the more strenuous football days of high school and college life, and then later become filled with omentum and intestines from strains not half as strenuous. These congenital sacs are early filled with their occupant. In acquired hernia the congenital peritoneal sac may not have been completely closed off and gradually

repeated intra-abdominal tension forces the contents into such a sac, but in most acquired hernias I believe the peritoneal sac is formed during the course of several years by being pushed downward from the repeated effort of the abdominal contents to enter the inguinal canal. At first such hernias are self-reducible, the change taking place without the knowledge of the patient. Later on when the patient is cognizant of the hernia he may manually reduce the contents but on the slightest exertion the sac again fills. This repeated filling of the sac causes a gradual development until the ordinary large acquired hernia is very evident. This naturally presupposes that the internal ring or the walls of the canal are weakened either congenitally or from some acquired cause. A similar weakness is present in the case of a recently acquired hernia following some severe strain. Examination of the sac, therefore, at an operation performed shortly after the appearance of the hernia, will show a recent bulging of the peritoneum through the weak spot without signs of tearing, ecchymosis or inflamed peritoneum which Moorhead claims must always be present if the sac has just formed.

Therefore, the author agrees with Dr. Bouffleur and unreservedly states that a small recently developed peritoneal sac can often be demonstrated at operation.

In order to determine, therefore, whether one of these "accidental" or "sudden" hernias is compensable or not, the surgeon must weigh very carefully all the evidence in favor of both the "natural causes" and the "unnatural causes." If the former predominate the employer is not responsible, but if the latter predominate he is responsible and under our present compensation acts the patient should be compensated.

In arriving at these conclusions the author has given the weightiest consideration to the arguments advanced by those execellent surgeons who claim that a true traumatic hernia can only result from the direct application of force to the abdominal wall and, therefore, only these rare hernias should be compensated. He has also considered carefully the claims of the others that any strain or lifting which causes the protrusion of the abdominal contents or the completion of that physical condition known as rupture, should be compensated as the strain was the contributing factor to the hernia. I have tried to demonstrate that most of the contention is due to erroneous use of the term "traumatic hernia" and that the just settlement of these cases depends upon a careful consideration of the moral and legal responsibilities in each individual case.

Thus from a medicolegal standpoint all hernias can be divided into two great classes, namely: *compensable* and *non-compensable.* The *compensable* hernias include: (1) The true traumatic, and (2)

the accidental or sudden hernias developing from unnatural occupational hazards. *Non-compensable* hernias include: (1) The true congenital hernias, and (2) the acquired hernias from natural causes.

There is an increasing tendency among many of our leading corporations, especially when they employ a surgeon, to operate on all cases of hernia occurring in their employ, paying the expenses of the operation and compensation for the period of disability. Some claim that they do this regardless of the medicolegal aspects of the case. The truth is that most of these concerns know that a hernia did not exist at the time of employment as a physical examination was made and if the applicant happened to have a hernia he was not employed. Therefore, when an employee develops a hernia during the course of his occupation and claims that some accident or severe effort brought on the condition, no employer can honestly state that the alleged injury did not play a contributing part in the development of the hernia. It is the surgeon's duty to carefully analyze all such cases and to advise the employer which ones should be thus compensated and which ones are not deserving of compensation.

The author recently analyzed from his records 135 cases of hernia which were found among the old employees of a concern which displayed a very generous attitude toward such cases.

One hundred and twenty of these had been previously examined and records showed no hernia present. Of the 15 who had not been previously examined, 4 had had the hernias since boyhood, 8 said the conditions had gradually developed and 3 claimed it had been due to recent injury.

One hundred of these 120 cases claimed or thought the condition was due to accident or thought it was caused by heavy work. Great weight must be given to these claims as all of these employees were recorded as not having hernias at previous examinations. They were all carefully considered by the above standards for compensable and non-compensable hernias.

Thirty of these were definite *compensable hernias*, and were operated and paid compensation.

Twenty-two were borderline cases and were, therefore, given an operation and compensation.

Forty-eight were not considered compensable because all showed well-formed hernias, could give no definite history of some unnatural cause, had not reported to their foreman or to the doctor after the alleged strain; in other words, did not have the earmarks of a "sudden" hernia following some unnatural occupational hazard. Twenty-one of these were given free operations but no compensation.

At the operations on the compensable cases the entire 30 showed small, recently formed sacs. In the 22 borderline cases only 4 showed

recent sacs. The remaining 18 showed signs of an old hernial sac which had evidently been closed off at the internal ring and was recently occupied by the abdominal contents, or showed small sacs with fibrous bands and even adherent mesentery. In these, however, the alleged accident had undoubtedly contributed to the reappearance or the completion of an existent hernial condition.

In the 21 cases which were operated but were not considered compensable, all gave definite signs of a hernial sac of long standing.

The average age of these 100 cases was 36 years. The youngest was 18 and the oldest 60 years.

Two of the cases were in girls, both having right indirect inguinal hernias. Neither of these cases had been examined previously but the history and indefinite statements as to cause placed them in the non-compensable class and this was borne out at the operation.

The average length of employment was 4½ years.

Forty-five were engaged in very heavy occupations, 26 in moderately heavy occupations, and 29 in clerical or light occupations.

Of the entire 135 cases, 47 per cent. were right indirect inguinal, 36 per cent. left indirect inguinal, 10 per cent. double indirect inguinal, 3 per cent. (all compensable) right direct inguinal, 2 per cent. double direct inguinal, 1 per cent. epigastric, and 1 per cent. femoral.

My analysis has been limited to this small number of cases because all fall within that group which has caused so much discussion among surgeons, namely, the "accidental" hernias and the borderline cases, with rather indefinite history of causal factor, and occurring among employees who had been previously examined and were recorded as having no hernias.

After examining several thousand cases of hernias and after operating several hundred, I have only seen five cases of true traumatic hernia due to direct violence at the point where the hernias developed. (1) In one, the man was struck in the groin by a crowbar; (2) a brakeman was crushed between the bumpers of two cars and a ventral hernia appeared; (3) a man was running through the aisle at fire drill and struck his left inguinal and scrotal region against a truck handle. A large contused area, swelling and hemorrhage into the scrotum immediately followed. Within three days a definite left, direct inguinal hernia appeared; (4) a pregnant woman was kicked in her left lower abdomen by her husband and very shortly a ventral hernia appeared and naturally increased in size as pregnancy developed; (5) a cowboy came to my clinic with two enormous oblique inguinal hernias. He gave a history of some two years previously having had a horse, he was riding, rear and fall over backward pinning him beneath the saddle. The pommel of the saddle had crushed into his lower abdomen. Immediately there was bulging

in both groins and these continued until they had reached the present size. The man denied any sign of rupture previous to the accident.

It is quite evident that even in those cases of inguinal hernia following direct violence, some doubt will always exist as to the possible presence of a congenital predisposition for hernia.

Fig. 197.—Double traumatic hernia following crushing injury, claimed to have resulted from horse falling on patient.

Industrial Commissions all over the country are depending on the surgeons in industry to arrive at a just and equitable decision concerning this subject of compensable hernia. It behooves us to drop the time-worn discussions about "traumatic hernia" and to tell them just what types of hernia should be compensated and what ones should not.

The first essential is to make a careful physical examination of all employees and to record those who have real or potential hernias. Whenever a hernia develops in one of these employees, who was recorded not to have a hernia, a careful analysis of his case must be made to determine: (1) was it entirely due to pre-existing defect? (2) was it entirely due to some severe direct or indirect violence? (3) was a latent condition already present and only aggravated by the unnatural occupational hazard? (4) was it due entirely to natural causes? (5) or was it due to a combination of all of these, and if so, which was the most responsible?

Every surgeon must then keep a careful record of his methods of determining these points. Whenever one of these hernias is operated a careful description of the condition of the sac and contents must be made with a view of determining which are the recently formed hernias and which are old conditions.

From all these records it will be possible to standardize definite methods of justly deciding which are the compensable hernias.

CHAPTER XLIII

THE COINCIDENCE OF ACCIDENTS AND DISEASE

Accidents often occur to employees who are suffering from some existing disease or who have some pre-existing disability. These coincidental conditions present many perplexing problems to the surgeon in industry. He must determine to what extent the accident is responsible for the disability and to what extent the diseased condition. He must decide whether or not the pre-existing condition was aggravated by the accident or whether the injury was complicated by the already existing disease. A very minor accident may occur and a few days later the employee may die, the result of some other pathologic state. A claim may be filed by the family for compensation for this death and here the surgeon is confronted with the problem of whether or not the minor accident was a contributing factor or merely coincidental.

The author has faced these problems many times and the management has voluntarily settled the cases on the decision arrived at by their surgeon. In every instance where there was a possibility of the accident being responsible the employee was given the benefit of the doubt. On the other hand, if the surgeon was convinced that the management was not responsible in any way the claims for disability were refused and in the very few cases which went to court the decision of the surgeon was always sustained.

These coincidental conditions can best be illustrated by the following case reports:

Case 1.—F. T. (male—23 years old) employed as a packer, had worked regularly at this job every day for the past year. On May 21, 1914, he stumbled over a box while employed and fell forward, striking the floor with his outstretched hands. He immediately felt pain in his right wrist and had all the symptoms of a sprained wrist. He reported to the doctor at once. The wrist was *x*-rayed and the laboratory reported a linear fracture of one of the small bones in the wrist. Plaster splint was applied and the employee allowed to go home. Recovery seemed to progress favorably for four days when suddenly the wrist began to swell. It was again *x*-rayed and this time the roentgenologist noted that two of the bones showed some change. Both wrists were then *x*-rayed on the same plate and at the same time. A comparison of the two showed decreased

density in all of the bones of the right wrist. The first plate was then carefully re-examined and what had been considered a fracture was found to be a small area of necrosis in the bone. A diagnosis of probable tuberculosis of the wrist was made and fixation treatment continued. A week later the x-ray showed definite necrosis of two

FIG. 198.—Tuberculous wrist joint discovered few days following injury to wrist.

of the bones and the others were beginning to lose their clear outline (see Fig. 198). In spite of complete immobilization of the wrist and keeping the patient quiet in bed the diseased condition progressed rapidly and within a month there were signs of fluctuation about the joint. After consultation it was decided that active operative treat-

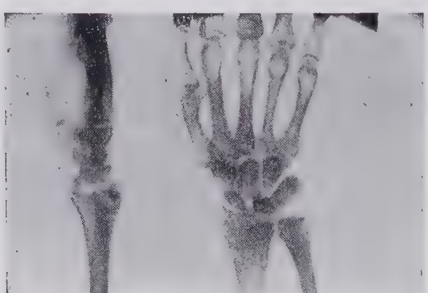

FIG. 199.—Same as Fig. 189, a month later.

ment was indicated; the joint was opened and all of the bones curetted out. Drainage was established and irrigations of weak iodin solution were given. The wrist was immobilized so as to give the best functional result on recovery. At the end of three months the wound had practically healed. Two months later this patient showed the

early signs of pulmonary tuberculosis and was sent to a sanitarium in New Mexico where he remained for eight months. He returned in excellent condition, all signs of the pulmonary trouble having disappeared. He had been using his right wrist for the last three months and to our surprise had considerable motion. The x-ray showed no signs of the tuberculous bone disease. At the end of thirteen months this employee was back at work. Realizing that it would be dangerous for him to return to heavy manual labor we had stimulated him to study along clerical lines so that on his return he was placed at clerical work. A year later this wrist showed signs of swelling and he complained of some pain. The x-ray showed no pathologic change in the joint but nevertheless it was immobilized and he was given a three months' rest in the country. The symptoms disappeared and thus far no further trouble has been noted.

In this case we had to deal with an accident to a wrist-joint, undoubtedly the seat of an already existing disease. The fact that the employee had noticed no trouble in the joint prior to the accident and yet almost immediately following it the diseased condition became acute caused the surgeon to decide that the accident was responsible for lighting up a pre-existing condition. It was impossible to state definitely to what extent the accident was responsible for his disability and to what extent the tuberculous condition should be held to blame. On the strength of this statement the management assumed complete responsibility and paid this employee his full wages during the entire length of his disability, including the three months he was absent from work a year later.

Case 2.—V. B. (male—26 years old) employed as a gas fitter, bruised his left forearm on a gas pipe. He showed the injured member to his foreman but objected to reporting to the doctor when this course was suggested to him. The foreman, thinking the condition trivial, did not insist upon his reporting. A week later he came to the doctor's office, complaining of swelling of the forearm and inability to use the member. It was immediately x-rayed and the radius was found to be thickened throughout its entire length. The condition was recognized as one of an old osteitis and could not possibly have been the result of the slight accident which he received. The patient denied any pre-existing disease in this arm. A Wassermann was taken but was negative. From the patient's brother the name of the family physician in the country was obtained. On inquiry by letter this doctor replied that he had treated the patient several years previously for a swelling of the forearm which he thought at the time was an osteomyelitis, but which recovered without operative interference. When Mr. B. was confronted with this evidence he replied that he had forgotten about that illness. He was told that he had better

return to work as the condition of which he complained had existed for many years and had no connection with his accident. He followed this advice and made no claim for the two weeks' loss of time.

In this case the management was advised that the accident and the pre-existing condition were merely coincidental and that the former had not been sufficiently serious to cause disability. The author has seen three cases somewhat similar to the above. Following a slight accident there was noted a thickening of the bone in the injured members. *X*-ray showed in each case a syphilitic osteitis and in each the Wassermann was positive. In two of these cases the condition completely cleared up under syphilitic treatment. In none of them was the injury held in any way responsible as the diseased condition had undoubtedly existed prior to the accident and was not aggravated by it.

Case 3.—T. J. (male—44 years old) employed as a packer, was struck on the right thigh by a heavy box. A considerable contused area resulted and was treated in the doctor's office at once. Two months later he reported because of a large swelling in the thigh at the point of injury. A tumor mass could easily be palpated and an operation was performed. A tumor about the size of a lemon was removed. The pathologic report stated that this was a syphilitic gumma. A Wassermann was then made and found to be 3 plus positive. Syphilitic treatment was instituted at once.

In this case it was decided that the accident had aggravated an existing disease. Besides the surgeon had performed an operation upon the patient which might have been avoided by proper syphilitic treatment. Full disability claims were paid to this employee.

Syphilis is one of the commonest conditions which complicate accident cases. Careful diagnosis is always necessary to determine whether the accident is responsible for the disability or whether this pre-existing disease is solely responsible, the accident merely being a coincidence.

Case 4.—F. H. (male—18 years old) employed by this concern for two weeks when he reported to the doctor's office with his right arm fractured near the shoulder joint. The history of the case was peculiar. He had been pushing a small truck through the aisle when he collided with another small truck. He felt something crack in his arm but felt no pain. He was unable to raise the arm after this accident. *X*-ray examination showed a pathological fracture due to a bone cyst which involved the upper four inches of the humerus.

The condition was carefully explained to the management and it was felt that, while there might not be any legal responsibility, yet the fact that this boy had been employed after a physical examination and then met with a slight accident while at work resulting in the fracture

of an already diseased arm, there was a certain amount of moral responsibility involved. Full wages were paid during the entire length of his disability. An operation was performed in this case and a bone transplant, seven inches long, taken from the tibia was inserted. Only a shell of the head of the humerus remained after the bone cyst was removed and the transplant was held firmly against this shell by suturing the soft tissues about it. It took six months for this case to recover sufficiently to return to light work. At the end of a year the bony defect was completely filled in and had practically regained the normal contour of the humerus. Perfect function was obtained in this case (see Figs. 173 to 176).

During his stay in the hospital he was persuaded to take up certain studies and after he returned to light work he attended night school, learning stenography and book-keeping. He stayed with the concern for a year after his recovery and then accepted a position with a bonding house where he has developed into a successful bond salesman. This boy was the son of very poor parents and was surrounded by poor environment. They were in no position to stand the expense of a law suit and if any other course had been pursued by this concern the chances are that this boy's future would have been jeopardized.

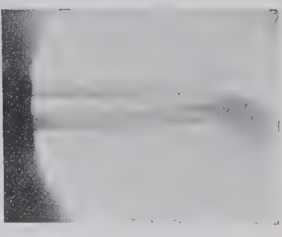

FIG. 200.—A bone cyst of the radius discovered after a slight occupational injury had caused a fracture. Is the employer responsible?

Case 5.—D. R. (male—21 years old) employed one year as a shipping clerk, was struck in the right side of his chest near the spine by a box weighing about 25 pounds, which was pitched by a fellow employee. He was immediately sent to the doctor's office although not complaining of severe injury. Inspection showed a small abrased area. This was dressed and he returned to work. The next day he reported for a dressing and was seen by the chief surgeon. This man's general appearance was not good; he was underweight, hollow-chested and rather pale. On questioning him, he stated that he had lost considerable weight during the last six months but no other symptoms were elicited. A thorough examination was at once made and revealed the signs of an early pulmonary tuberculosis, the diagnosis of which was proven by finding tubercle bacilli in the sputum. The wound was practically healed and needed no further attention. However, following the usual custom of this concern, the boy was told of his lung condition, and was sent home. A nurse called that afternoon and asked his mother to come in to see the chief surgeon. The next day she called and the boy's condition was carefully explained to her. She was told that the slight accident which he suffered had no relation to

the tuberculosis, but, following its usual procedure, the management was willing to pay this employee's expenses at a sanatorium until the lung condition had been arrested or cured. The mother's consent was gained and the patient was sent to Edward's Sanatorium, Naperville, Ill. Eight months later he returned with the disease arrested. He was advised, however, both at the sanatorium and at the office to continue his treatment at home for two months longer and not to return to work. Three weeks later the management received notice from a lawyer that this patient had entered suit for permanent disability due to pulmonary tuberculosis and Pott's disease, both of which were the direct result of a serious accident received while in their employ. After many diplomatic maneuvers the chief surgeon finally persuaded the patient's lawyer and doctor to consent to a consulation in order to ascertain whether or not the Pott's disease was present. This consent was gained on the grounds that we would consider the blow from the box a contributing factor to Pott's disease if the condition had developed at or near the site of injury, but we would not consider the accident in any way responsible for the pulmonary tuberculosis. At the consultation and with the aid of the best *x*-ray experts in the community we were able to disprove the presence of Pott's disease. Claim for disability on account of pulmonary tuberculosis was made, however, and the case went to trial. We had no difficulty in proving that a pulmonary tuberculosis which at no time presented any acute symptoms and which was discovered the day following the accident was never caused by, nor aggravated, by this injury. The court further observed that the concern had been very generous in its treatment of D. R. by offering him the opportunity of being cured of a tuberculous condition for which they were not responsible.

Case 6.—H. B. (male—26 years old) reported to the doctor's office with his right heel severly bruised as a result of being struck by a truck. This man's general appearance was not good and a thorough examination was immediately made. Pulmonary tuberculosis in the second stage was diagnosed and was confirmed by numerous tubercle bacilli in the sputum. Within a week he had recovered from the injury to his heel. This man was likewise given free sanitorium treatment because of his lung condition, although the concern was in no way responsible for it. Four months later we were notified by the sanitorium's physician that this patient's right foot and ankle were badly swollen. He was sent back to the city and placed in a hospital. *X*-ray examination showed a condition of tuberculosis of the right ankle-joint. The foot, ankle and leg were placed in a plaster cast and the patient was returned to the sanitorium where he was kept completely at rest. The cast was changed every three weeks. He

was kept in the sanitorium for fifteen months at the end of which time the pulmonary condition was arrested and signs of the disease in the ankle-joint had disappeared.

The surgeon held that the management was responsible for the tuberculous condition in the extremity because a severe injury had occurred to the heel and ankle of a man already suffering from pulmonary tuberculosis and, as a result of the injury the resistance of the part was lowered and made possible the extension of the disease. An insurance company might have fought this case and brought up legal barriers to any claim of disability. However, there was undoubtedly a moral responsibility involved and, without any claims for disability on the part of the patient, the concern voluntarily assumed this obligation.

Case 7.—This was another case of tuberculosis of the bone. This patient was struck by a heavy plank just above the right knee. On examination a severe contusion was found. There were scars of a previous diseased condition about the hip and over the entire length of the right femur. The history of the case showed that this patient had suffered from tuberculosis of the hip and the femur during his boyhood, some twenty years previously. Four weeks after the injury the patient developed considerable swelling in the lower thigh, pain and tenderness and a low grade temperature. *X*-ray showed necrosis involving the greater portion of the lower third of the thigh. He was operated upon and three weeks later a second operation was necessary. Almost a year elapsed before this patient recovered. At no time were the symptoms acute but were those of a chronic osteomyelitis, evidently of a tuberculous origin. The accident was held responsible although undoubtedly the pre-existing disease was the chief contributing factor. Full compensation was paid this man.

Case 8.—Miss B—28 years old—a three weeks' employee, fell from the second step of a stepladder striking on her buttocks. Examination failed to reveal any sign of injury although the patient was very hysterical and nervous from the moment of the accident. A vaginal examination was not made. Two weeks later this young lady entered claim for disability on account of a retrodisplacement of the uterus and a dislocated coccyx. She had consulted a lady physician who had examined her vaginally and made this diagnosis. The patient was able to be up and around but had not returned to work. At first both the patient and her doctor refused to allow the company surgeon to make an examination. Finally the surgeon called on the family physician and explained to her that if these conditions were present the concern would pay full compensation. Since she was so positive of her findings it was suggested that she call in a consultant and the surgeon would call in a consultant and the four would make a complete

examination of the case at the same time and decide what pathologic condition, if any, existed and to what extent the accident was responsible. This plan was carried out and neither of the two consultants nor the company surgeon were able to find any signs of a retroversion or of a dislocated coccyx. It took two weeks, however, to persuade the patient that she was only suffering from the mental suggestion of her doctor and no real condition. After she returned to work she was given her full wages for the four weeks lost time as the accident had made this comedy of errors possible.

The author has been able to stop many claims for compensation by this plan of arbitration by two consultants, chosen one by the family physician and one by the company surgeon. Usually when four doctors thus get together each feels it a matter of pride to make a correct diagnosis without at the time considering its bearing on compensation. If such a policy were universally adopted many damage suits could be equitably settled by the doctors without the expense and wrangling injected into the case by placing it in the hands of lawyers.

Case 9.—Medical cases, as well as surgical, present many of the above difficulties. P. G. (male—48 years old) a printer, working for the concern some six years, reported to the doctor's office because of dizziness, shortness of breath and general weakness. The examination showed a blood-pressure of 180 degrees and albumen, hyalin and granular casts, in the urine. All reflexes were reported as normal at this examination. A diagnosis of chronic interstitial nephritis was made. This man was granted a six months' leave of absence on full pay. At the end of that time he was dropped from the pay roll. He belonged to the Printers Union and was entitled to a small weekly benefit for quite a period from them. A short time after this the management was notified by the wife that her husband was in the hospital under treatment for lead poisoning and that his occupation as a printer was responsible for the condition. She entered claims for disability and threatened suit unless these were paid. The chief surgeon arranged for a consultation with the doctors in charge of this case at the hospital. The history, which his doctors had obtained stated that the patient had been suffering paroxysms of abdominal pain for the last four months. He had grown progressively weaker and had developed paresis of his left leg. There was a mild foot-drop on the left side. Severe constipation was present and the urine examination showed a low grade nephritis. The laboratory report showed basophilic degeneration of the red cells, with a marked secondary anemia. The Wassermann test was negative.

The above findings, coupled with the fact that this man had been a printer, and exposed to lead during the last six years had caused his

physicians to make the diagnosis of lead poisoning and in their judgment they were honestly justified in advising the man's wife that his employment was responsible for the condition.

The chief surgeon proceeded to make a thorough examination from head to foot. He found all of the conditions described above, but in addition a decided ankle clonus was present; the Babinski sign was positive; and a typical saddle anesthesia was discovered. After having demonstrated these signs to his physicians consent was obtained to make a spinal puncture and have a Wassermann test made on the spinal fluid. This was done and half of the fluid removed was sent to the laboratory at this hospital and half of it was taken to one of the expert laboratory men of the city. The report from both showed a very decided Wassermann reaction in the spinal fluid. A diagnosis of syphilitic spinal meningitis was made and was agreed to by the patient's physicians. The patient died a month later but before his death he confessed to his wife that he had contracted syphilis before they were married, although in all the histories taken of the case he had denied this infection. It was not until this confession was made that the wife was satisfied that his occupation was not responsible.

This case very aptly illustrates this problem of coincidental diseases. The doctor on the staff of this industry, who examined the patient first, failed to discover the syphilitic condition because after a routine examination he was able to make a diagnosis, namely, chronic nephritis. Later the physicians who attended this patient felt that they had worked up the case very thoroughly and found a sufficient number of symptoms, combined with the history of the employment of the patient as a printer to enable them to make a diagnosis of lead poisoning. They were very honest and efficient physicians. However, before any doctor makes a diagnosis or a statement which involves claims for large damages against any industry he should be mighty sure of his grounds. These coincidental diseases which are usually the specific causes of the disability can only be discovered by going over every case with a "fine tooth comb."

Strained Backs.—Employees complaining of strained backs following overlifting, sudden twisting of the body, falls and like conditions furnish the best examples of slight accidents coincidental with a diseased condition. These cases are often the most difficult to determine the exact responsibility, and when it is decided that disease is the underlying cause it requires the most convincing arguments to persuade the employee that it is not the result of some strain.

The histories of these cases are quite similar. An employee reports to the doctor's office complaining of severe pain in his back. He is often slightly bent forward and both hands are pressed into the small

of his back. While talking he will catch his breath due to a sudden paroxysm of pain in the back. He states that when he left home that morning he was perfectly well but after working awhile he tried to lift a heavy box, or some other object, and must have strained his back, for a sudden pain struck him and he couldn't straighten up. Or he will tell of twisting his body while exerting himself and the strain of the back resulted.

It is peculiarly characteristic of these cases that if they are considered as injuries and, therefore, compensable, they will have a prolonged period of disability. Whereas if the true nature of the condition is discovered at once and they are treated as diseases the period of disability is greatly shortened.

A thorough physical examination should be made at once of all such back cases. A special search should be made for foci of infections in the teeth, tonsils, prostate, and about the nails. The urine should always be examined. Signs of rheumatism in other parts of the body should be sought. An x-ray examination will occasionally show a chronic arthritis about the spinal vertebræ, especially at the sacro-iliac joints. Careful questioning will often bring out the fact that similar attacks have occurred.

The nature of the alleged accident should likewise be thoroughly investigated. Was the overlifting or twisting of such a nature as to result in a strain of the muscles of the back or to actually tear some of the intervertebral ligaments? When an accident is responsible for the back condition usually it causes a direct injury to the soft parts over the back, as a contusion from a fall, or it is of a sufficiently serious nature as to cause a strain to anyone subjected to a similar accident.

By weighing the evidence thus collected the surgeon can usually decide whether the condition is a lumbago, myositis, neuritis or typical rheumatism due to conditions already existing in the patient's body; whether the accident was the sole cause of the trouble; or whether there was an existing predisposition and the alleged accident aggravated the condition. In the majority of instances these cases will be found to be due to disease and the slight strain is in no way responsible except as "an alarm clock which suddenly awakens the dormant condition."

All of these facts must be patiently and tactfully explained to the employee. He must then be persuaded to have the focus of infection removed, or the diseased condition treated.

I have seen many recurring attacks of so-called strained backs in employees which promptly yielded to tight strapping with adhesive plaster and a few days rest. After these employees submitted to dental work or to the removal of diseased tonsils the attacks practically always ceased to recur.

During one year 156 employees reported to the doctor's office on account of strained backs due to alleged accidents. In one of these there was a definitely bruised back and the general examination was negative. In twenty the nature of the extreme effort, or exertion or fall was such as to justify straining of the back and they were considered compensable cases. In only eight of these were mild foci of infection found, the remainder being apparently free of infection.

The remainder were diagnosed as follows and gave the following findings of preëxisting infections:

(1) Lumbago		82
(*a*) Pyorrhea	13	
(*b*) Abscessed teeth	32	
(*c*) Extremely bad teeth	3	
(*d*) Diseased tonsils and teeth	10	
(*e*) Diseased tonsils	10	
(*f*) Acutely inflamed tonsils	1	
(*g*) Acute "colds"	8	
(*h*) Acute gonorrhea	1	
(*i*) Chronic gonorrhea	2	
(*j*) Nephritis	1	
(2) Strained (?) back with other conditions		8
(*a*) Flat feet	6	
(*b*) Diseased tonsils	2	
(3) Myositis		3
(*a*) Bad teeth	1	
(*b*) Diseased tonsils and teeth	1	
(*c*) Influenza	1	
(4) Neuritis and myositis		4
(*a*) Bad teeth	1	
(*b*) Diseased tonsils	2	
(5) Rheumatism		13
(*a*) Diseased tonsils	4	
(*b*) Bad teeth and tonsils	2	
(*c*) Pyorrhea	1	
(6) Sacro-iliac arthritis		2
(*a*) Bad teeth	1	
(*b*) Diseased tonsils	1	
(7) Sciatica		3
(*a*) Diseased tonsils	1	
(*b*) Flat feet	2	
(8) Miscellaneous		20
(*a*) Slight strain	10	
(*b*) Rheumatic tendency	2	
(*c*) Not diagnosed, history obscure, no findings, lost no time	8	

These 156 cases lost 511¾ days from work. Every one of the cases with teeth trouble had dental work performed under the supervision of the plant dentist. Twenty of these employees submitted to removal of the diseased tonsils. The flat-foot cases had their arches strapped and suitable shoes and arch supports were secured.

These figures prove the value of thoroughly searching for the cause in all cases of so-called strained back. Otherwise much loss of time from work will ensue and many of these employees will become the typical "back-neurotic" requiring many weeks of compensation.

Many other cases could be quoted, illustrating the problems presented when accident or disease is complicated by some coincidental pathologic condition. No definite rules can be laid down for determining the responsibility for disability resulting in such cases. It is usually impossible for any physician to honestly divide this responsi-

Fig. 201.—A lymph-edema of the hand and arm following a slight scratch, from a pin, while at work. At first a mild infection developed which was incised and drained. The above condition followed and persisted for over a year. Under hot dressings it would disappear to recur again in a week or two. A month after the accident a Wassermann test was made and was positive. Antisyphilitic treatment was given and in four months all Wassermanns were negative. The condition resisted every line of treatment and finally seemed to disappear spontaneously. Undoubtedly a coincidental condition existed in this case, but following an accident as it did the concern was held responsible.

bility, assigning a certain percentage to the accident and a certain percentage to the associated condition. Each individual case must be carefully analyzed and these questions must be settled by considering both the moral and legal aspects involved.

Industrial compensation commissions will find these questions, as well as other medical problems, can best be solved by disinterested medical consultants rather than by lawyers. Therefore, every such commission should have its staff, consisting of the best medical and surgical talent, in order that the greatest justice may be done both the employer and the employee.

CHAPTER XLIV

OTHER TRAUMATISMS WITH MEDICOLEGAL ASPECTS

With the tendency of large corporations to depend more and more on the decisions and statements of their surgeons as to the compensable nature of various accident cases it is very essential for every surgeon in industry to develop a medicolegal sense. In fact such a sense, if acquired by all physicians, would undoubtedly reduce the claims for compensation materially, for the exaggerated statements of doctors to their patients are the commonest causes for exaggerated claims.

Many state compensation laws permit of the settlement of claims between the employer and employee without a hearing before the boards, a receipt of the amounts of compensation paid being all that is required. Only disputed claims, therefore, come before the industrial board. In such states the medical profession and especially surgeons connected with industry, or with insurance companies, have a great responsibility placed in their hands. They at once become the judge and jury in many injury cases and on their honest decisions depend the rendering of right and justice to both employer and employee.

There is a more or less prevalent impression that the family physician favors the side of the employee, and the surgeon in industry favors the employer's side, while the insurance doctor is prejudiced in favor of the insurance company.

Unfortunately this was too often the case in old days when our personal injury suits were settled in courts. Such prejudices are becoming less prevalent in these days of employees compensation.

If every surgeon will adopt a policy of absolute honesty, will become a just judge, and will render his decisions after a careful consideration of the medical, moral and legal aspects of each case, and if employers will then make just settlements in all cases where they are either morally or legally responsible, there will be a lessened tendency for employees to make exaggerated claims of disability; in the long run they will receive greater compensation than by the old system of court trials, interested expert witnesses, and legal counsel.

Certain traumatic conditions will always arise, however, which will cause disputed claims. The growing tendency of compensation commissions to employ their own medical staffs of disinterested surgeons, who can render just decisions in these cases, is reducing such claims materially and is resulting in greater justice to both sides. Undoubt-

edly the enactment of health insurance laws, enabling working men to receive compensation for conditions which are not considered compensable accident cases would reduce these disputed claims to a minimum.

Many authorities have argued that employees' compensation and workmen's health insurance would at once mean a greatly increased number of neurotics and malingers. It has been my observation that since quick and more liberal settlement of employees claims for disability have been adopted the number of cases of traumatic neuroses and malingering have decreased. For nine years I have had the privilege of serving a concern in which all five year employees received full wages during the entire period of their disability on account of sickness, and all employees of less than five years service could join the benefit association and receive two-thirds of their wages while absent on account of sickness. All accident cases received full wages during their entire disability. Such a liberal policy has given ample opportunity for studying the effect on imaginary conditions and on malingering.

In the case of sickness there has been a greater tendency to prolong disability by claiming neurotic or imaginary conditions among the employees receiving just two-thirds of their wages than among those receiving full wages. During the entire time I have not seen more than ten cases of downright malingering of disease among this entire group of employees.

Many cases of traumatic neuroses and a few genuine fakirs have developed among the injured employees, but a less number than I have seen among the employees of other concerns which depended upon insurance companies to settle their claims.

Moorhead's experience adds weight to my belief that proper compensation for either accident or disease will reduce the number of exaggerated and false claims. He says, "since the Workmen's Compensation Law went into effect in New York State, (July 1, 1914) I have been impressed by the freedom from exaggerated claims, and ascribe this to the fixed payment rates for definite injuries and to the non-interference of a certain type of physician and lawyer. During the first twenty-six months of the operation of this law many thousands of employees were more or less injured in the various activities of the railways with which I am connected. Of this number, over 90 per cent. required one treatment only, and thus the very great proportion might have prolonged disability by asserting subjective symptoms if the proper motives existed. Of the more seriously hurt, comparatively few exaggerated to any great extent, and I recall but few whom we regarded as out-and-out fakirs. I know of but few cases in which marked traumasthenic symptoms developed."

The tendency of certain unscrupulous physicians and lawyers to abet injured persons in their exaggerated claims for damage during the old days of personal injury suits has resulted in a mass of "court-room pathology" which clogs the machinery of justice in our state industrial commissions charged with employees' compensation. Such terms as "railway spine," traumatic hysteria, and even many of our so-called traumatic hernia owe their origin and basis for frequent claims to many court proceedings. Injured employees in the past were not so much to blame for malingering or for developing traumasthenic symptoms as were these outside forces—the self-seeking lawyer and the physician who so often unwittingly or otherwise played into his hands.

In these days of social democracy, when the surgeon in industry is playing so important a part in securing better relations between industry and labor, it behooves all of us to strive to our utmost to wipe out this blot on our professional history and in the future render our medical opinions to both the injured employee and his employer solely with the view of seeing justice done to both.

TRAUMATIC NEUROSES

"Traumatic neurosis" (Oppenheim), "traumasthenia" (Moorhead), "nervous shock," "hysteroneurasthenia" and similar terms have been applied to certain, definite subjective manifestations which often appear following trauma.

These conditions form the most frequent basis for exaggerated claims for accident compensation. They complicate almost every known type of injury but more frequently occur with the less serious than with the very serious injuries. An extremely dangerous accident which might have killed the patient but which only resulted in moderate injury furnishes a common incentive for these traumasthenias. The injury sustained is usually of such a nature as to justify only a short partial disability and the neurosis becomes the real cause for prolonged disability and even for claims for permanent disability.

In the past many of these conditions were regarded by excellent authorities as real neural injuries and were given such names as "spinal concussion," "railroad spine" (supposed to be most often due to railroad injuries), "railroad brain" and similar terms. These neural injuries were described as "molecular changes" similar to those which are supposed to occur in concussion of the brain.

Of recent years there has been a decided tendency to doubt the existence of any real neuroses, some claiming that the condition is only assumed or shammed for a definite reason. Many of the cases of so-called "shell shock," occurring in soldiers who have never been near

the front, have strengthened this belief in some observers, while others feel that "shell shock has proven the reality of such neuroses."

There are all types and degrees of these peculiar psychological states, following fear, fright, mild injury or severe injury, and manifested either by pure faking or malingering; a mild nervousness; real neurasthenia; a combination of self hypnotism, giving a mild hysteria with a certain amount of malingering; a real hysteria; or neurasthenia associated with hysteria.

Excellent contributions to medical literature have been given on this subject of neuroses by Oppenheim, Mott, Bailey, Moorhead, Freud, Janet, Strumpell and many others. It is not my purpose to enter into an elaborate description of these various states for to do so would mean a repetition of much that has been written. I prefer to express my private opinions and impressions concerning traumatic neuroses even though such an expression may not be couched in the classical terminology of the psychologist or the neuropsychiatrist.

These traumatic mental states can be divided into (1) true neurosis; (2) a combination of neurosis and faking; (3) true faking. Some would say that the cause of the last named condition is simply "a born liar," but this is hardly correct. A careful analysis of the fakir will reveal some abnormal or perverted mental state which places him likewise in the neuroses group.

The etiologic factors in traumatic neuroses can be divided into (*a*) predisposing, and (*b*) exciting. The predisposing causes are:

1. **Moral Instability.**—In my opinion this is the underlying cause of all these conditions and without it the other predisposing causes would cease to exist.

One psychologist has said that for a child of three to lie is normal, for a child of six to lie is not serious, but for a child of twelve to lie is tragic. To lie does not imply the spoken lie, but includes acting lies and is manifested in many forms such as cheating, feigning, etc. This trait often becomes such a definite part in the mental emotions that without volition the feigning, or other form of falsifying, occurs. This tendency may lie dormant for years and then when the subtle temptation (predisposing causes) presents itself the feigning consciously or otherwise manifests itself.

I have seen a child of three complain of headache or a sick stomach, or just sickness in order to escape punishment for some wrongful act. I have seen a child of six who has disobeyed his parent and who is fearful of the impending punishment turn pale, develop a rapid, irregular pulse, complain of nausea and actually vomit and become sufficiently sick as to require the attention of a physician. These children represent many varied types of neuroses and every physician has seen such cases. Usually we ascribe them to a "spoiled

child." The mental stimuli necessary to bring on these neuroses in children take many forms such as fear, desire for personal gain, opposition, revenge, etc.

Analogous conditions are common in adults. A man is late to work and he frames up an excuse of sickness; he may even go to the toilet several times feigning a diarrhea. Or in order to forestall censure for his tardiness he will limp when reporting to his foreman and complain of rheumatism. Another man will fall behind in his work; fearing censure he semiconsciously constructs his excuses and usually these take the form of some bodily ailment. Thinking of this condition causes it to develop subjectively and soon he is forced to lay off with true neurasthenic symptoms.

A patient of excellent character became greatly depressed over his failing business. He sought financial help from his father but it was refused. He then became very sick with stomach trouble, vomited frequently, lost weight, developed an anemia and his doctor feared cancer of the stomach, and let the patient know of the fear.

On account of his illness his father was finally forced to advance some money in order to save the business. Immediately the patient improved and was well within two weeks.

There are many recorded cases of women who have developed the worst types of neurasthenia, hysteria, and even of faking in order to gain some desired end such as, a trip to California, or to regain the affections of a husband, or to revenge some wrong.

All of these are examples of an unstable moral tone whether they occur in the child of three or in the adult of thirty-three. This failure to develop a proper moral balance will often light up an emotional state seeking interpretation in some form of neurosis.

Foster Kennedy in his contribution[1] entitled "The Nature of Nervousness in Soldiers" demonstrates most clearly that the loss of "morale" in a soldier is the basis of his neurosis. He says, "What is this thing we call morale? Is it not the expression in each soldier of his herd instinct, of his willingness to sacrifice himself for the benefit of his kind, and for the ideals held in common by his countrymen and himself? It is a loyalty to his mates, to his officers, to his regiment, to his nation, and, in the last instance, to the ideals of life for which his nation stands, and it is measured by his conscious willingness to suffer, his capacity for sacrifice in the common good. It is a quality born of the tribe, a product of gregariousness and so held socially in good repute. It is constantly expressed in thought; it is a real component of the soldier's conscious intellectual life. The shrinking from loss and the fear of death on the other hand are but rarely scrutinized in their realities;

[1] Jour. Am. Med. Assoc., Vol. 71, No. 1.

they are antisocial in trend and so are cast down, by good citizens, into the limbo of subconsciousness.

"Perhaps I seem to you to have been wandering from my subject by these considerations; but for some months past I have been trying to discover something of the dynamic influences in our men, and I feel that a clue to the genesis of the neuroses is to be found in the antagonism on the one hand of the conscious emotions of loyalty and morale with their concomitant urge to self-sacrifice, and, on the other hand, the more or less satisfactorily repressed instincts for the conservation of individual life."

This lack of morale, the loss of his high ideals, a lack of conscience enables the soldier who fears the fight to unconsciously develop a neurosis; or the soldier who longs for escape from the horrors and abominations of the trenches to develop "shell shock" without any visible signs of injury. All authorities report that the seriously wounded seldom if ever develop neuroses. Why should they? Their wounds give them the honorable means of escape from these horrors. They have been true to their ideals, have maintained their morale, and now can rest and receive their reward.

A similar condition exists among employees. If every effort is made to keep their morale at a high point; if fatigue, worry and unfairness is reduced to a minimum; and if liberal and square dealing results in adequate rewards when injuries are received, the number of cases of neuroses will be reduced.

Thus the lack of individual morale—a moral instability—forms the soil upon which the other predisposing causes grow and finally blossom into a true traumatic neurosis when cultivated by the exciting cause.

2. **Desire for Gain.**—The great majority of traumatic neuroses occur among those seeking compensation for their injuries. In the days of personal injury suits when damages for $10,000 or even $25,000 were sought and the trials extended over a period of months or years these neuroses were far more prevalent and the cure more difficult. Even to-day with employees' compensation laws the cases are common. Fortunately fixed rates of compensation, reducing the amount of damages which can be collected, and early payment of the claim have removed this predisposing cause.

If compensation commissions would recognize the true nature of these cases they would make it legally impossible for the payment of claims for permanent disability on grounds of "nervous shock," "nervous exhaustion" or any form of neuroses. The compensation should be limited to the organic condition. Weekly compensation for a certain period for the neuroses could be paid but after their consultants were satisfied that a neurosis case could return to work further payment should cease.

The fact that so many of these cases recover rapidly after the claim is paid is used as an argument by many that the employee was faking. Again revert to the child who develops a typical neurosis, with subjective and objective symptoms, and who soon recovers after his end is gained. Sometimes it is necessary and best to grant the child's desire, and again he must be cured by making it quite plain that he can die first before the desired toy or other wish is granted. Our neurosis case has the same emotional instability and must be handled according to his individual indications.

The desire for a vacation; or the desire of revenge, as when a doctor belittles the injury and the patient determines to "show him up;" pride, pity, pique and other similar emotions, all are examples of personal gain which may be the predisposing factor.

3. **Fear and Suggestion.**—The element of fear and fright are very strong stimuli for the development of neuroses. A serious accident, or witnessing a catastrophe, with no or very little injury resulting, is a common cause for these conditions.

Fear of pain in an injured part may cause the patient to cry out and wince at the least touch. This soon becomes a habit and is one of the most difficult forms of neurosis to overcome, unless carefully treated from the very beginning.

Fear of serious complications will often cause the subjective, and at times the objective, symptoms of the dreaded condition to develop.

Suggestion is often the breeder of fears that result in the most serious types of traumasthenias. The doctor will suggest "internal injuries" to either the family or the patient direct; or he will talk freely before the patient of the serious complications which developed in another patient similarly injured. The lawyer can subtly suggest many permanent disabilities and very shortly is gratified to see these develop. By far the greatest number of cases of traumatic neuroses appearing in the courts have undoubtedly been due to these hetero-suggestions from physicians, lawyers, relatives and well meaning friends rather than to autosuggestion on the part of patients.

Proof of this is amply furnished by the fact that injured employees treated in hospitals and surrounded by proper environment under the close supervision of the plant surgeon seldom have marked neuroses.

Neurasthenia, and even hysteria due to fear and suggestion is not limited to accident cases. The suggestion of a stomach analysis in order to rule out a possible cancer or ulcer will often result in the most prolonged neurasthenic state. Rich patients who can afford to run from one doctor to another with every minor ailment, collecting a vast store of fears and suggestions, furnish the best examples of neurasthenia. Such patients are "cured" by Christian Science

and make up a large proportion of the congregations of the Scientist Church.

4. **Psychic Impressions.**—Patients who have been in serious accidents, such as a train wreck, a falling elevator, a fire, etc., without receiving any noticeable injury frequently develop neuroses. Hysteria and malingering more often result from such accidents. Neurasthenia will follow more serious injuries in which serious complications are feared but do not develop. If such injuries are received in accidents accompanied by frightful sights, sounds or other impressions, this type of neurosis is more liable to occur. Either psychic trauma or real injury occurring to a patient who has been under abnormal stress and strain or to an emotional person having the so-called "hysteric temperament" may cause the development of any type of neurosis, but most commonly that of hysteria.

5. **Race.**—It has been the common observation of all authorities on this subject that the Jewish race, especially the very poor or the very rich, are the most susceptible to neuroses. This is undoubtedly due to the emotional temperament, characteristic of the Hebrew. The condition, however, is not more common among the intelligent Jews than among other nationalities. I have found the Irish and Italians, especially among the very poor and less educated classes, also quite susceptible to these conditions.

6. **Age and Sex.**—I have cared for thousands of injuries among girls and women and have found traumatic neuroses far less prevalent among them. They develop more mild neurasthenic or hysteric conditions but the severe forms more commonly appear among the men. On the other hand, hysteria from all causes oftener affects women than men and, as is well known, this type is commonest at the age of puberty or at the time of menopause. The traumatic neuroses have more frequently appeared in employees over the age of thirty than under it, in my experience.

The **exciting cause** for these traumatic neuroses is an accident which results in a real or imaginary injury. Such injuries may occur to any part of the body and may vary from the slightest to the most severe trauma. Injuries to the head, abdomen or spine more frequently result in neurasthenia, while injuries to the back or extremities are more commonly the cause of malingering. No one regional injury seems to produce hysteria more than another.

"Traumatic Neurasthenia" and **"Traumatic Hysteria"** are the recognized types of functional neuroses following trauma. The neurasthenic and hysteric symptoms developing after an accident, do not differ to any extent from the functional diseases described as neurasthenia and hysteria, which occur without the exciting cause of trauma. The diagnosis of neurasthenia is not nearly so common as

it was a decade ago and this is generally because better diagnostic methods have revealed a real organic disease in many of these so-called functional states. In the same way the diagnosis of traumatic neurasthenia is becoming less common.

The functional disease known as hysteria is now recognized by many as a mental disease and the stigma or signs of this condition pre-existed in all patients who later develop the disease. Traumatic hysteria, therefore, is simply the combination of a trauma occurring to a person with this pre-existing stigma and thus exciting an outbreak of the hysteria. If such a patient gains considerable attention or gains a large compensation, the tendency toward a recurrence of traumatic hysteria is increased. In fact a most important part of the treatment of these traumatic hysterias depends upon the handling of the settlement. Both employers and compensation commissions often increase the hysteric stigma by assuming a too generous attitude toward such patients.

Traumatic neurasthenia on the other hand is a much more tangible condition. The patients are more susceptible to reasoning and the tendency to recurrence is rare.

A most complete description of these traumatic neuroses is given in Moorhead's "Traumatic Surgery" and the reader is referred to this for an adequate description of the symptoms and diagnosis of these conditions.

Treatment.—The question of whether these neurotics will have prolonged weekly compensation, terminating finally in claims for permanent disability depends altogether upon the handling of the case by the surgeon. If his suggestions of a more serious trouble than really existed has been the predisposing factor in the condition, or if he has undiplomatically antagonized the patient by accusing him of faking, or of merely "being nervous," better results can be obtained by changing surgeons. Patience, tact, cheerfulness and the ability to inspire confidence are essential qualities in a surgeon who would successfully handle traumatic neuroses.

We must recognize that a certain percentage of all accident cases will possess this tendency to develop neuroses, therefore, the surgeon must approach every emergency case in such a manner as to inspire the confidence of the patient from the beginning. If he shows undue excitement, assumes a grave attitude, hesitates in his various procedures and otherwise shows indecision he can very easily plant the seeds for "traumatic neurasthenia." Many a case of traumatic hysteria receives its incentive from the blustering surgeon who gets his nurses and assistants greatly excited, who starts one line of treatment and discards it for another, talks unguardedly about the serious nature of the case and finally suggests that the patient should go to a hospital

but ends by allowing him to go home. In other words, the emergency surgeon must be a person quick to make his decisions and gentle but firm in his handling of the case.

The best treatment of traumatic neurasthenia is to remove the patient to the hospital under favorable environment, win his confidence and then by a frank talk and careful explanation of all symptoms gradually disperse his fears. A more rapid and permanent cure can be obtained in this way than by the use of medicines and other forms of treatment. During this period the injury must be most carefully handled and its seriousness must not be too greatly belittled; certainly it must never be exaggerated. The objective symptoms, chief of which are pain and insomnia must be combatted often with medicine. Useful and interesting bedside studies and occupations are of the greatest benefit in these cases and will relieve the patient's introspection, which is usually the basis of his condition.

The traumatic hysterias should likewise be removed to suitable environment; the successful surgeon will draw upon his imagination in order to conceive various forms of subtle suggestion designed to work a miraculous cure. Usually the friends and relatives must first be convinced of the hysterical nature of the trouble. Unless this is done, the sympathy and suggestions of a loving relative will most likely prolong the disease. These patients will present various emotional states, which can best be combatted by the surgeon assuming similar emotional attitudes. For example, the cunning in the hysteric must be met with cunning in the surgeon. Every effort must be made to win the confidence of these patients before any sudden cure can be accomplished. Generally, medication is seldom indicated except as a means for gaining this confidence. The local symptoms such as pain, paralysis, contractures and special sense defects must be treated both medically and surgically, always with the view of suggesting a cure. It is quite apparent that the value of any suggestive treatment will be lost if the antagonism of the patient, rather than his complete confidence is aroused. For example, if one of these patients develops generalized convulsions and the surgeon in disgust and often in anger applies extreme pressure on certain painful areas, such as supra-orbital regions he may cut short the attack but he has aroused a certain amount of antagonism in the patient. On the other hand, if he gains this patient's confidence and explains to him that a certain type of painful treatment, such as this pressure, is necessary to accomplish a cure, he will get much quicker results.

Slight back injuries often result in most extreme types of traumatic hysteria. A strained, exaggerated position is assumed by such a patient and he may even develop a paralysis in one or both legs. A careful diagnosis should first be made to rule out all signs of organic

injury. This implies the use of the x-ray, motor and sensory tests, etc. All of these methods of examination must be conducted in a matter of fact way so as not to arouse further suggestions in the patient's mind and with the view to increasing his confidence in the surgeon. After the diagnosis of hysteria is positively proven and this confidence is established, the surgeon can direct his utmost efforts toward combatting the hysteria, and the more sudden and miraculous cure which can be attained the more certain its permanency. Many of these cases can be handled successfully in the following manner:

The proven hysteric is told that local applications of heat by special instruments are necessary to cure the condition and such treatment can only be given at the hospital. After arriving at the hospital the patient is prepared for the treatment by certain medication. He is told that the medicine is very nasty but must always precede the application of heat. He is given a large dose of asafetida followed immediately by a seidlitz powder, followed a few minutes later by tr. of ammonium valerinate. This administration is made with great solemnity and with expressed sympathy for the person who must take such bitter potions. He is then taken to the dressing room, his back or paralyzed limb exposed and is asked to point out the place where the pain or trouble seems to be the most acute. A cutting needle, about 2 inches long is then heated, so that the patient can see it, until it is red hot, when it is suddenly plunged into the soft tissues and immediately withdrawn. The real pain from this procedure is slight but the psychologic effect upon the patient is remarkable. This treatment is not carried out in a spirit of punishment. It has been suggested to the patient innumerable times that such treatment usually accomplishes an immediate cure and I have found it seldom necessary to repeat this procedure.

Electrotherapy and hydrotherapy are markedly beneficial in many of these cases. A stream of cold water, shot from a hose pipe with force, against the affected part is very effective. These patients can often be easily hypnotized and, while in the hypnotic state, the paralyzed limb is found as useful as the other limb. The patient who has not walked for weeks will sometimes be cured on awakening from the hypnotic state and finding himself standing alone. Anesthetized patients can be similarly treated. I have seen some wonderful cures by merely suggesting that the next day the patient will be anesthetized and the contracted limb forcibly straightened. On the surgeon's visit the next day the condition has often corrected itself.

The following case history will illustrate the methods which must often be employed to successfully combat these traumatic hysterias:

Mr. M., 55 years old, employed as a mechanic in a plow factory, in a town some 50 miles from Chicago, was struck a glancing blow on

his left shoulder and left side of his head by a moving crane. He was knocked down but was not unconscious. A cab was called and he was taken to the doctor's office, where an examination failed to reveal any injury except a slight contusion on the shoulder. He was sent home and the next day was able to return to work. That night the surgeon was hurriedly called to his home because the patient had evidently had a stroke of paralysis. The surgeon found the patient suffering from an apparent paralysis of the left arm and left leg and with his face contorted and cyanotic and the jaws fixed so that it was impossible to open the patient's mouth. This condition persisted for several hours when the patient finally relaxed. The paralysis, however, persisted. A few hours later he had another attack, and this time the spastic condition involved the left arm and left foot. It lasted for only a few minutes when the patient again relaxed. These attacks recurred every few minutes for the next 24 hours.

The local surgeon called the author in consultation. When I arrived the patient was resting quietly and had not had an attack for two hours. I started my examination but on lifting the paralyzed left arm an attack was immediately induced. The jaws were fixed, the face contorted, and the eyes open and staring. The left fist was tightly contracted while the left arm was held perfectly rigid, and the toes contracted. Respiration practically stopped and the patient became very cyanotic. He seemed to suffer intensely. The picture this man presented was most distressing and the grief of his wife and one of his daughters was uncontrolled. Another daughter, who was a nurse, sponged her father's face with cold water and tried in other ways to relieve the condition. The son, who was present, expressed himself bitterly toward the concern responsible for his father's condition. The paroxysm lasted about two minutes.

There were no facilities for x-ray examination in this town and I recommended that the patient be brought at once to Chicago and put in a hospital where his case could be thoroughly studied. This plan was agreed to and arrangements were quickly made to take the patient on the next train which left within an hour. During the excitement of getting ready the patient had only two attacks. He was carried to the train on a cot and placed in the baggage car, the surgeon and the son riding with him. He had no attacks on his way to the city.

Immediately after arriving at the hospital these attacks returned and occurred at frequent intervals. An x-ray examination failed to show any signs of injury and after a study of the case for a few hours a diagnosis of hysteria brought on by the slight trauma was made.

It was quite evident that the family, especially the daughter who was a nurse, could not easily be convinced that their father was simply

suffering from hysteria. Therefore, I decided a miraculous cure was necessary. Within 48 hours I had gained the implicit confidence of the patient and the family, which was primarily essential in the handling of such a case.

By this time the attacks were infrequent. It was suggested, however, in the patient's presence that he could easily be thrown into an attack by endeavoring to forcibly close his left fist. Each time that the nurse, interne or surgeon attempted this procedure the patient would immediately develop a paroxysm. I then carefully explained to the patient that the attacks could be prevented by the use of a certain expensive drug which I had ordered and which would be delivered the next day. Both the nurse and the interne expressed great impatience in the presence of the patient for the arrival of this drug. The next day I appeared with a small bottle of quinin sulphate. The method of procedure was then carefully explained to the patient. He was to put his tongue out in order that I might coat it over with this medicine; at the same time he was to forcibly press on his right ear with his right hand and elevate his right leg at an angle of about 45 degrees and hold it in that position until the medicine took effect. Meanwhile I would forcibly close his left fist, but "because of the drug and the effect on his circulation of these various acts on his part, no attack would develop." The plan was carried out and with great success. He complained of the bitter medicine but was greatly gratified by its wonderful effect. A short time later, without the use of the medicine or of elevating the leg and pressing the ear, we tried to close his left fist and an attack immediately developed. The above line of treatment was then again carried out successfully. This was repeated several times until I was convinced that the patient was thoroughly imbued by the suggestion.

One of the best nerve specialists of the city was then called in consultation. The patient was thrown into an attack by pressure on the left fist and from the symptoms and history of the case the specialist agreed with the diagnosis of traumatic hysteria. The entire family was present during this consultation and for this reason the specialist was warned against telling them at that time the nature of the condition. After he had completed his examination I told the family and the specialist of the wonderful cure which I had effected by means of this drug and proceeded to demonstrate the method to them. It was again successful. I then suggested to the patient that the same effect could be achieved by holding his right leg in the air, pressing on his ear, sticking out his tongue, without using any of the medicine and again the results were successful. It was now time to tell the family and the patient the nature of his trouble. The bottle of medicine was shown to them and they were told that it was nothing

but old fashioned quinin. The daughter, who was a nurse, verified this statement by tasting of it and by asking the hospital nurse and interne if this were true. She completed the cure by turning to the other members of the family and stating that their father had been fooling them. By this time the patient was in tears and was greatly distressed. I immediately sent the family from the room and comforted him, meanwhile assuring him that he had had a real condition from which he had been cured and that now he could get up and walk. His clothes were brought and in a short time I led him out to the family, a well man.

The details of this case are set forth in order to demonstrate the essential factors in rapidly curing this type, and most other types, of traumatic hysteria.

These essentials are: (1) An early but positive diagnosis of the condition; (2) securing the absolute confidence of the patient and the family; (3) removing the patient to a hospital where his entire environment can be carefully supervised; (4) ingeniously devising a line of treatment which will carry the greatest amount of suggestion and which usually involves some foolish act on the part of the patient which can later be used to demonstrate the foolish nature of the disease to both the patient and the family; (5) securing a sudden and miraculous cure; (6) selling the cure to the relatives and friends.

Many cases of traumatic hysteria can be cured without the payment of compensation if the surgeon will familiarize himself with the special psychological conditions which apply in each case. These analyses require individual handling and no hard or fast rules can be laid down which are applicable to the entire group.

MALINGERING

Malingering takes one of two forms. It is either a combination of hysteria or neurasthenia with subtle faking, or pure faking. To call all malingerers downright fakers is misleading and will often cause the surgeon to overlook the neurasthenic and hysteric conditions, which very frequently are combined with the malingering. On the other hand, deliberate faking of both subjective and objective symptoms occurs frequently without any evidence of organic or functional disease. The patient deliberately lies in order to accomplish his end, which is usually that of gain or revenge. I prefer, therefore, to divide these malingerers into two classes: First, the true malingerer and second, the absolute faker.

True malingering manifests itself frequently in cases of fracture or severe strain, or other injury which requires several weeks of convalescence accompanied by very little pain. These patients become

hospitalized, that is, they enjoy the life of ease in the hospital, incentive is lost, and they dread returning to work. All manner of symptoms are feigned, usually with two ends in view: first, to prolong their stay at the hospital or their period of absence from work; second, to develop a case of permanent disability with the view of collecting full compensation.

In a large ward, occupied chiefly by railroad employees, I have seen this type of malingering spread like an epidemic. A congenial group of these men happen in the hospital at the same time; they enjoy smoking and playing cards together and lose all desire to go home. The surgeon must ever be watchful for symptoms of this type of malingering. Ward occupations, wholesome entertainment and often punitive treatment, administered with the greatest kindness, are necessary to overcome hospital malingering.

To successfully handle malingerers it is necessary to let the patient think he is fooling you. Sympathize with him and by suggestion assist him in exaggerating his symptoms more and more. "Give the calf plenty of rope and he will hang himself" applies most aptly to these cases. Even relatives who at first believe in the true nature of the patient's complaints will soon come to realize that he is exaggerating his trouble, if not faking it. Some cases of malingering can be nipped in the bud by immediately demonstrating that the patient has lied, followed by a severe arraignment. This line of treatment, however, should not be followed unless the surgeon is quite positive he can cure the condition by severely lecturing the patient. If you fail in obtaining an immediate cure you have antagonized the man, put him on his guard and will have greater difficulty in showing him up later on. The following case demonstrates one of the best methods of handling these malingerers:

S. B., male, 40 years old, stepped backward into an open elevator shaft while working in the basement and fell to the bottom of the shaft some six feet below. A truck which he was pulling at the time also fell into the shaft but did not strike the employee. Two fellow employees immediately lifted him out of the shaft and he was brought to the doctor's office. Examination failed to reveal any serious injury but he had sustained considerable bruising over his right buttocks. He complained bitterly of his symptoms and immediately gave evidence of an emotional temperament with a hysterical tendency. On account of this he was persuaded to go to the hospital. He was kept in bed for three days and was then told he could get up and walk around the ward. On attempting to walk he showed a very exaggerated limp. I sympathized with the patient and told the interne in the patient's presence that he undoubtedly had developed "mock-malign syndrome" and most probably would lose the sense of feeling in the

affected leg, or would be bent over sidewise, and made other ridiculous suggestions. The next day I submitted this patient to a thorough examination conducting it with a great deal of solemnity and aiding him by suggestion to exaggerate his symptoms more and more. He complained of severe pain on pressure over the back and the painful points were carefully marked with a pencil as he pointed them out. Other regions were examined and then the back re-examined, with the result that the patient could not accurately relocate the same spots. Painful spots were similarly found in the leg and the different "relocation areas" marked. The pin-prick test showed areas of anesthesia in the leg. These were also marked and similar tests applied later on with the result that the anesthetic areas had shifted. These tests were made with the patient lying down so that he could not see the inaccuracy of his statements. The patient was then told to stand up, place his feet together, throw his head back and close his eyes, the surgeon meanwhile holding his body steady. The interne was told to stand behind the patient and catch him if he fell backward "which they usually did when suffering from this particular disease." On letting go of the patient he immediately fell backward into the interne's arms. This was repeated several times. It was now time to expose the frauds which the patient thought he was perpetrating. He was again placed with his feet together and his head back and this time the interne was told to "stand aside and let the patient fall to the floor and break his neck if he wanted to for he was only faking the symptoms anyway." Upon saying this the patient's body was released and he was told to go ahead and fall, but he never did. The inaccuracy of the relocation tests were pointed out and it was carefully explained how we had deliberately allowed him to think he was fooling us. A careful record of his case had been kept and this was read to him in order to prove that we could refute any claim for disability which he intended to make. He was then told that if he returned to work at once his job was waiting for him and nothing would be said about his attempted fraud. On the other hand, if he persisted in his faking he would not only lose further compensation but his job as well. The next day Mr. B. returned to work.

The final examination as above described was conducted in the presence of his wife and brother. I have found it always much better to expose the patient's malingering in the presence of his relatives as it chagrins the patient more and usually convinces the relatives of the true condition.

The majority of malingering cases develop after injury to an extremity, especially involving a joint, as the knee, shoulder, ankle and hip joints. Slight injury to the back is also a frequent cause for malingering. Careful study of the motions of a "stiff joint" will reveal

that the patient is using it when his attention is otherwise diverted. Likewise a careful study of the limp which he develops will show many variations in it. The surgeon must become a veritable detective in order to catch these malingerers off their guard. When sufficient evidence of the faking has been collected the surgeon, who up to this time has been very sympathetic, can turn on the patient in righteous indignation and usually succeed in convicting him of fraud.

In the cases of **absolute faking,** both the subjective and objective symptoms are deliberately planned with the intent to deceive. Such patients must be handled as described for malingering and the cure always depends upon discovering the fraud and exposing the patient.

Besides faking the symptoms, these employees may deliberately injure themselves in order to gain their end, which is usually more compensation. This type of faking is best illustrated by the case of J. D., whom we operated for a so-called traumatic hernia. The stitches were removed on the eleventh day and the wound was perfectly clean. Four days later it was infected, having considerable pussy discharge. This infection resisted all treatment. A week later I *x*-rayed the wound in order to make sure that no foreign material could have been left in the tissues, which as you know, is very unlikely in a hernia operation. The *x*-ray showed a pin buried in the upper end of the wound. This was removed without much difficulty but the patient was not told about it. A few days later the pussy discharge had ceased but the wound in the skin was not completely healed. The patient was allowed to go home, however, and instructed to report to the doctor's office for subsequent dressings. A week later the wound again became infected and began to discharge profusely. It was explored by forceps and several small bits of rags were removed. Without saying anything to the patient, who was a boy of only eighteen, his father and mother were sent for and the history of the case told to them. The pieces of rag removed from the wound were shown to the mother, and she indentified them as parts of her dish towel, which she had noticed recently had been cut. They were naturally indignant at the son and left determined to punish him for his act. On reaching home, however, they found that the boy had packed his clothes and left. He was found a month later, living in Michigan with an old bachelor who had shared his room at the hospital. Detectives placed on the case found that this bachelor was a pervert who had misled the boy.

I realize that the above description of traumatic neuroses very inadequately covers this subject. However, I have endeavored to point out the most important facts about these conditions which the surgeon in industry should know in order to successfully handle a situation which is very common in industrial practice.

TRAUMATIC APOPLEXY

Bollinger has described certain cases of cerebral apoplexy which occur some days after a head injury. We realize that severe trauma often is responsible for a middle meningeal hemorrhage or other serious intracranial hemorrhage. In such cases, the nature of the wound and usually the finding of the condition at autopsy place these in the proper category of compensable conditions due to accident.

The later development of apoplexy, however, after a head injury is more often due to the systemic conditions ordinarily the cause of a "stroke of apoplexy," and the trauma should be regarded as coincidental. Because of the liability of such a claim I insist upon a thorough physical examination, including blood-pressure in all cases of head injury. Recently an employee fell and sustained a scalp wound. He was a man fifty years of age, very fat and the general examination showed albumen in his urine and a blood-pressure of 220. It was utterly inconceivable to connect this systemic condition with the injury which occurred just an hour previously. This employee recovered from the scalp wound but a month later died from a stroke of apoplexy. The record of our careful examination at the time of injury enabled this concern to refute the claim of traumatic apoplexy.

It frequently happens that a person will fall while at work, or will fall from the step of a street car, or into an exposed gutter while walking in the street. When picked up it is found that he has suffered a stroke of apoplexy and has sustained an injury to his head. The question immediately arises: was the injury responsible for the apoplexy or was it sustained as a result of his falling when the stroke occurred? From the medicolegal standpoint such cases will often present themselves for solution. An injury to the head, sufficiently serious to rupture the small calibered "artery of apoplexy" will certainly rupture other blood-vessels nearer the site of the injury. If the patient is not dead the general examination will show the high blood-pressure and other signs of the apoplectic state. If dead, the autopsy will reveal these signs as well as the typical apoplexy.

The surgeon in industry should constantly watch for these obscure conditions in injured employees which may later be the basis for an unjust claim for compensation.

TRAUMATIC APPENDICITIS

I have seen several cases in which appendicitis developed a few days after trauma to the abdomen and were, therefore, made the basis of claims for compensation. On only one occasion have I felt justified in even remotely connecting the trauma with the inflamed appendix. This occurred in a small boy who was run over by an automobile, the

wheels passing directly across the middle of the abdomen. The skin was abrased and contused over the appendix regions. I have described this same case in the chapter on "Compensable Hernia" as the boy also developed a hernia following this injury. Three days after the accident he complained of severe abdominal pain in the region of the appendix. This was followed by vomiting, rigidity, tenderness and temperature. The leukocyte count rapidly mounted to 26,000. At first it was thought that the symptoms might have some connection with the hernia on the left side but it was soon evident that we were dealing with a case of appendicitis. He was operated ten hours after the attack began and a swollen, acutely inflamed appendix removed. There were no adhesions or other signs of a pre-existing appendicitis. The lumen of the appendix was filled with soft fecal matter but there were no fecal concretions. Microscopically the changes were those of acute inflammation of the appendix. There was no history of abdominal colic, "sick stomach" or similar conditions which might indicate a former appendicitis. Two of the best surgeons in Chicago saw this case with the author and agreed that, while it was quite probable the appendicitis was only coincidental yet it was impossible to prove to the satisfaction of the family or any jury that the trauma was not the direct cause of the condition. It may be of interest to know that this boy developed an acute intussusception just a year after this accident and was operated by another surgeon. He died following the operation. The family felt that this condition was the result of the previous injury but the surgeons who handled the case felt that the previous injury was only a coincidence.

Dr. Charles Rowan who saw the above patient, told the author of a case of traumatic appendicitis which he had seen in the County Hospital some time before. This also occurred in a boy of six years. The youngster fell from a tree and struck a picket fence, causing a severe laceration directly over the appendix region. Two days later he developed an attack of acute appendicitis which was verified on operation. There were no pathologic findings which indicated a previous attack of appendicitis.

The majority of claims for this condition, however, develop in cases where the nature of the injury to the abdomen is not at all serious. Careful questioning will reveal the fact that the patient has had abdominal symptoms previous to the trauma. In other cases, the attack develops several weeks after the injury and during the interval there were no manifestations of intra-abdominal disturbance.

Sprengle, Deaver, Moorhead and others who have written on this subject feel that it is scientifically impossible to trace the relationship between appendicitis and trauma no matter how serious the latter may be. When we consider how protected this tiny organ is and how

much more readily the larger abdominal viscera could be injured it is very difficult to conceive of a trauma having any etiological element in the development of an attack of appendicitis. As Moorhead has so aptly pointed out "the abdominal violence may occasionally act as an alarm clock for the re-awakening of a dormant, inflamed appendix."

TRAUMATIC DISPLACEMENTS OF THE UTERUS

Girl employees very frequently complain of displacements of the womb as a result of injury. In my experience the commonest causes for these claims are such accidents as falling down stairs, or being forcibly knocked down by some fellow employee running through the aisle, by a truck, or an automobile. Practically every one of these claims develops after the girl employee has consulted the family physician; or quite frequently after some lady physician has told her that a displaced womb has resulted from the accident. Often this statement is made by the family physician without a vaginal or rectal examination being made. These girls will complain of severe pain in the back and of painful menstrual periods, both of which "never existed prior to the injury." All such cases should be submitted to a thorough pelvic examination. This should always be done in the presence of the mother or a lady relative and a nurse and preferably with the patient anesthetized with nitrous oxid. Where this has been done, I have never found a case which showed the uterus displaced except in two older women, both of whom showed other evidence of a displacement of long standing, such as relaxed vaginal walls, and in one a definite cystocele and rectocele.

Personally, I am convinced that a permanent displacement of the uterus never follows direct violence. It is conceivable that such a violence might cause a temporary displacement but the organ would undoubtedly almost immediately resume its normal position. Pelvic symptoms may follow severe trauma in the region of the pelvis as a result of this temporary displacement and these must be treated by rest and other means, often requiring temporary disability such as may follow any strain. The only compensation, therefore, which should be paid such cases is for this temporary disability. It is often cheaper in doubtful cases to repair the condition, paying compensation for the time lost from work, just as in the case of doubtful hernias, rather than allow the condition to persist with the subsequent claims for permanent compensation.

TRAUMATIC ORCHITIS

This condition may develop from falls, blows and other forms of direct violence to this organ. Frequently, however, employees will report to the doctor's office with a swollen testicle, exceedingly painful,

which they claim is due to an injury, or more often to a severe strain while lifting. If careful examination is made, a gonorrheal infection will be discovered in many of these cases, thus showing the real cause of the condition. The important point, therefore, in traumatic orchitis is to always make sure that gonorrhea is not present. However, a direct violence to the testicle even in a gonorrheal patient may furnish cause for compensation.

The above examples are sufficient to illustrate the number of remote conditions associated with trauma which can develop and which present medicolegal aspects. It is very evident, therefore, that the surgeon in industry must acquire a keen medicolegal sense. Above all he must not let his desire to discover false claims prejudice his judgment against the true compensable traumatic conditions.

CHAPTER XLV

HEALTH INSURANCE

Twenty-five years ago in my father's little factory, employing some 50 people, every man knew "John" and father knew them. The friendliest human relations existed between him and his hands because of the personal touch which could be maintained. Labor turn-over was small because the men were satisfied. If one of these employees became sick, or sickness assailed some member of the family he usually dropped in to see if anything was needed. Often financial help was the most urgent need. Money was freely advanced, which could be paid back in small installments after the existing emergency had passed.

With the growth of industry and the combination of these small factories into one gigantic concern this personal relationship between employer and employee was lost. The president of the concern replaced the old proprietor, the general superintendent replaced the "boss" and the "hands" became human machines. They missed the old-time contact with the head of the firm and the seeds of dissatisfaction and distrust were sown, later to bear fruit in "labor troubles."

During the early days when industrial enterprises in this country were expanding at a terrific rate the employers were absorbed in a fierce battle for their survival. This was interpreted as selfishness by the employees and unfortunately in many cases it was a true interpretation. Labor began to combine and battle for its survival.

Since the old friendliness between the boss and his men had died labor unions began to replace it. Sick funds were created and when one of the members was forced to remain away from work on account of illness he was given aid from this fund. Those employees not so fortunate as to belong to the labor union class were often left destitute when sickness attacked them. Humanity recognized that some assistance must be rendered these unfortunates and their families and charitable organizations sprang into being. Now practically every city has its Associated Charities.

About fifteen years ago a few large industries, with a far-sightedness that was interpreted by many as "fads," "philanthropy," "conscience-easers," and similar states of mind, began to recognize that something was wrong in this economic arrangement. These men began to re-

establish the human relationship between employer and employee. It was impossible for the executive to become intimate with his thousands of employees and to show a personal interest in their welfare, but he could utilize different agencies to represent him in this new relationship.

The results of this new viewpoint showed that a good business sense rather than philanthropy was behind all such movements. However, this relationship was never successful when based on a selfish foundation; the mutual welfare of each was the absolutely essential motive, guided always by the spirit of the Golden Rule.

In ever increasing numbers have the industries of the country adopted this new spirit and with its growth labor troubles have been decreasing. But at the outbreak of the war the old selfish attitude on the part of both industry and labor was still predominant. The necessity of speeding up production in order to supply our armies with the sinews of war is resulting in recognition of the human engineering processes advocated for many years by many workers in this field and which have been successfully applied in several instances.

Disease is our common enemy. It arouses sympathy for our assailed brother and wins his gratitude when assistance is offered at such a time. On this account good medical and surgical aid provided by the employer for his employees has proven to be the best humanizing agency ever introduced into industry. And as one of our greatest business men has said: "The medical department pays the biggest dividends."

No other one factor has been so potent in calling the attention of our people to the waste in human life and human energy as this medical work in industries. It has paved the way for several momentous advances in preventive medicine and preventive surgery. It has provided methods for excellent care of the sick and injured employees. But it is greatly handicapped in its work of mercy by the lack of financial support of the employee during his time of forced idleness due to sickness.

As a result every physician in industry is a strong advocate of some form of health insurance which will prevent poverty from being the most powerful ally of disease, as it is at present. These physicians may differ widely on the exact nature and methods of administration of this form of insurance but that some form is needed is harmoniously agreed by all.

Practically all of the great industrial countries of Europe have had health insurance for many years, as well as insurance against accidents. The American Association for Labor Legislation, the American Manufacturer's Association and one or two commissions appointed by state legislatures have made extensive studies in Europe of these

systems and much of our proposed legislation is based upon their plans. The country will always be indebted to the first named organization for the part it has played in stimulating this great social movement. Many different agencies in the country have opposed the views expressed by these organizations but the discussion thus aroused has resulted in a closer study of the question. At the beginning of the war at least fifteen different commissions and associations in this country were scrutinizing every proposed angle of health insurance. These commissions were of one accord in that they would not accept any European plan in part or in toto, but that the system of health insurance finally adopted by America must accomplish its purpose without unduly affecting the personal rights of any individual, unduly disturbing the economic conditions of the country or placing an injustice of any kind upon labor, capital or the state. If, after a most intelligent study of this question, proper legislation is passed, there will inevitably follow some of the greatest social reforms our country has yet seen. It is, therefore, worthy of comment that, instead of the legislatures of the various states hurriedly passing proposed health insurance laws, many of them have appointed commissions and appropriated large sums of money for a complete study of the subject with recommendations as to the proper form legislation should take. Some of the opponents of this movement are endeavoring to prolong these studies and thus delay the necessary laws. We must not unduly hasten these investigations but every man who believes in health insurance must give his assistance and use his influence for an adequate health insurance law just as soon as possible.

Mr. John B. Andrews, Secretary of the American Association for Labor Legislation, in an address before the National Conference of Social Workers in 1917, gave the following résumé on the progress toward health insurance:

"Progress toward workmen's health insurance has probably aroused more earnest discussion in a greater number of interested groups than has any other single campaign in the whole field of social legislation. Following as a logical next step the enactment within seven years of workmen's compensation laws in four-fifths of the American states and territories—and with America stigmatized as the only important industrial nation of the world without compulsory health insurance—it is natural that definite proposals for publicly insuring against the wage-earners' sickness should have excited exceptional comment. Undoubtedly, too, the method by which the legislation was presented had something to do with the spirited discussion of its merits—an educational effect of justly reputed value in our political democracy.

"The definite health insurance program was formulated by a special

national committee whose members had been most active in consistently working for adequate standards in workmen's compensation laws. With a preliminary conference in Boston in December, 1912, at the annual meeting of the American Association for Labor Legislation, this committee organized the First National Conference on Social Insurance, held in Chicago in June, 1913. One year later 'tentative standards' were widely distributed for criticism and suggestions and as a result of numerous meetings and much correspondence with representatives of labor, employers, and physicians, the first tentative draft of an act for health insurance was published in November, 1915. Second and third revised editions with explanatory notes have resulted in a preliminary distribution of more than 25,000 copies while reprints in professional and trade journals and in pamphlets represent an additional circulation of at least double that number. Every effort has been made to stimulate helpful discussion, both sympathetic and hostile. Although still in tentative form probably no piece of social legislation in this country has had more careful preliminary consideration. The educational results have amply justified both the method and the effort.

"**Principles of the Standard Bill.**—In brief, the standard health insurance program is the result of a growing conviction that sickness is one of the principal causes of poverty, that sickness is an insurable risk, that existing agencies for meeting the problem are inadequate and place upon those who do insure against sickness an unjust and unnecessarily high burden and this without fully utilizing the preventive value of mutually administered workmen's insurance. Provision is made for the universal application of health insurance to all workers earning less than a specified amount by requiring that while at work a few cents per week, based upon and deducted from earnings, shall be placed in a fund, under state supervision, to which the employer contributes a like amount and the state one-half as much. The system is non-contributory for workers receiving less than a specified minimum wage. When incapacitated by illness or by accident not covered by workmen's compensation, the workman would be entitled to receive at the expense of the fund adequate medical, surgical and nursing care and two-thirds of wages until able to resume work, but not for more than twenty-six weeks' incapacity in any one year. For fatal cases a funeral allowance of $100 is provided and for women workers and for the wives of insured men provision is made for maternity care. Administration of this insurance recognizes trade union funds, establishment funds and fraternals as approved societies but encourages the formation of mutual local or trade funds to be jointly conducted at actual cost. No provision is made for recognizing profit-making or commercial insurance companies.

"**Endorsed by Official Commissions.**—Bills based upon this standard measure were introduced in three legislatures in 1916 and in a dozen states in 1917. Meanwhile official social insurance commissions in California and Massachusetts were investigating and early in 1917 the California commission announced that, in a survey of the social insurance field, it had reached the unanimous conclusion to center all efforts upon health insurance as the logical and most practical next step following workmen's compensation. The commission concisely stated unanimous agreement in the following sentence:

"In order to meet the problems of destitution due to sickness, and in order to make health insurance a valuable adjunct to the broad movement for the conservation of public health, any legislation on this subject should, in the opinion of the commission, provide (*a*) for a compulsory system for the conducting of the insurance by non-profit making insurance carriers; (*b*) for a thoroughly adequate provision for the care and treatment of the sick, and (*c*) for contributions from the insured, from industry and from the state.

"The Massachusetts commissioners attempted by means of sub-committees to deal with the whole field of social insurance during the brief half-year between legislative sessions and naturally arrived at conclusions not entirely acceptable to all of the members of the commission. In endorsing the principle of health insurance, however, the commission was unanimous. A majority of the members were furthermore in accord with the main provisions of the health insurance bill introduced this session in the Massachusetts legislature, and believed that the system, to be effective, must be compulsory and that the cost should be distributed among employer, employee, and the state. The major report, submitted by the sub-committee on health insurance, was signed by four commissioners, including the chairman of the commission. Briefly, the report in its recommendations agrees in most particulars with the conclusions reached independently on the opposite coast by the California commission. The Massachusetts report recommends compulsory, contributory workmen's health insurance legislation, with private stock companies operating for profit excluded from the field. 'The plan of insurance,' states this report, 'most likely in our opinion to prove successful is one in which the carriers are mutual associations managed by employers and employees, equally.' Thus the Massachusetts report agrees in this particular also with the legislative proposal of the American Association for Labor Legislation.

"Executive encouragement to the health insurance movement was not lacking. Governor Hiram W. Johnson, in commending the work of the California commission, said in his message to the legislature: 'I believe in health insurance, and that ultimately it will be established in our nation, and this within a brief period.' Governor Samuel W. McCall in his inaugural address urged the Massachusetts legislature to

enact compulsory health insurance, saying: 'I am strongly of the opinion that there is no form of social insurance that is more humane, sounder in principle, and that would confer a greater benefit upon large groups of our population and upon the commonwealth as a whole than health insurance.'

"**Eight States Making Investigations.**—In California it was believed that a peculiar constitutional restriction in that state might endanger the safety of compulsory, contributory health insurance, and the legislature, therefore, promptly passed through both houses for the ratification of the people a constitutional amendment declaring it to be 'the policy of the State of California to make special provision for the health and welfare of those classes of persons, and their dependents, whose incomes, in the determination of the legislature, are not sufficient to meet the hazards of sickness. The legislature may establish a health insurance system, applicable to any or all such persons, and for the financial support of such system may provide for contributions, either voluntary or compulsory, from such persons, from employers, and from the state by appropriations.'

"In order to continue the work of education and legislation in California there was appropriated for the expense of the commission an additional sum of $22,500. In Massachusetts where the momentary confusion which accompanied our nation's entrance into the war gave a temporary setback to all social legislation there was later provided a special recess commission, this time to concentrate on health insurance, with the usual arrangement as to necessary expenses. In Illinois and Pennsylvania health insurance commission bills were enacted with expense appropriations of $20,000 and $5000, respectively. Ohio created a commission to study both health insurance and old age pensions and voted $25,000 for the purpose. Wisconsin, moved by a growing sentiment for health insurance legislation, authorized official study of social insurance and appropriated $5000. Connecticut embodied health insurance in an omnibus commission study bill, and the New Jersey commission to inquire into old age dependency and insurance reached the conclusion that any comprehensive plan for old age relief should be preceded by universal workmen's health insurance. Thus in no less than eight states official investigation of health insurance is under way.

"This rather remarkable progress toward health insurance was no doubt stimulated to a degree by various official reports. Following a two years' survey of occupational diseases under the general direction of Dr. Emery R. Hayhurst, the Ohio State Board of Health declared that 'underlying the high sickness and death rate prevalent among wage-earners is the industrial factor,' that inadequate legislation and inefficient inspection are due to lack of interested co-operation from

employer and employee, and that 'until some direct incentive to improve factory sanitation is offered little real progress can be hoped for. The cash value set upon health by health insurance promises the needed stimulus.' In harmony with this conclusion was a special bulletin on health insurance issued by the United States Public Health Service, in which a compulsory, contributory system mutually managed and without opportunity for profit-making was strongly recommended. Similar to this in effect was the conclusion of the United States Commission on Industrial Relations. Finally the United States Commissioner of Labor Statistics in a brilliant paper before the International Association of Industrial Accident Boards and Commissions, of which he is the distinguished secretary, is strongly on record as favoring 'health insurance—universal, compulsory, state health insurance—true social insurance.'

"**A Rapidly Increasing Public Demand.**—Scarcely less important than the official steps noted above have been the many endorsements of health insurance by private organizations. Closely following the tentative standards drawn up by the Association for Labor Legislation have come vigorous expressions of approval from numerous labor, civic and medical societies and from forward looking employers.

"In addition to local trade unions and city central organizations throughout the country more than a dozen of the most influential state federations of labor and national and international trade unions have adopted resolutions favoring the principle of health insurance and have left no doubt as to their stand in reference to commercial insurance participation. Opposition to such profiteering is thus pointedly expressed in the resolution adopted last November by the American Federation of Labor:

"Resolved: That the American Federation of Labor in Thirty-sixth Annual Convention assembled, declared against private insurance, or insurance for profit, as it may apply to industrial, social or health insurance.

"Among a large number of outstanding leaders in the American labor movement who are on record in favor of health insurance are John Mitchell and James M. Lynch, who are now members of the New York Industrial Commission; James Duncan, the president of the Granite Cutters' International Union and First Vice-president of the American Federation of Labor; and William Green, Eighth Vice-presient of the American Federation of Labor and Secretary-treasurer of the United Mine Workers, the largest trade union in America. The National Women's Trade Union League at its convention in June, 1917, went strongly on record for health insurance, including maternity care, for the millions of women workers. In harmony with this sentiment is the following conclusion: 'A governmental system of

sickness insurance is preferable because: More democratic; the benefits would be regarded as rights, not charity. Compulsory features, obnoxious under private insurance, would be no longer objectionable . . . European experience has proved the superiority of government systems to private insurance.'—Final Report, U. S. Commission on Industrial Relations; signed, among others, by John B. Lennon, Treasurer, American Federation of Labor; James O'Connell, Second Vice-president, American Federation of Labor; Austin B. Garretson, President, Order of Railroad Conductors.

"Organizations of employers have been less ready to publicly go on record for a system of health insurance which is bound to cost them a considerable initial outlay no matter what returns they later receive through the increased efficiency and contentment of a healthy working force. But even here, as in the case of the Boston Chamber of Commerce, desire has been expressed to have the subject studied, and the best informed employers have not hesitated to say that they regard the coming of health insurance as inevitable. Ferdinand C. Schwedtman who, as chairman of an important committee of the National Association of Manufacturers made a study of European experience with social insurance, in a preliminary report in 1914, said: 'I give it as my opinion that sickness insurance of some kind, with compulsory contributions on the part of the employers, will be enacted into law by many states of the Union within the next five years, and that now is the time to go into this subject thoroughly.' The National Association of Manufacturers committee, now under different leadership, has not been able to reach and maintain this open-minded attitude. By way of comparison it is interesting to note the following conclusion reached in 1916 by the committee on public relations of the American Electric Railway Association:

"The benefits of health insurance can only be made wide-spread by making insurance compulsory. Compulsory insurance can be best introduced by the employer making a substantial contribution toward the cost of insurance, considering such contribution as a part of the wage payment and an element in the cost of production.

"Just as the compensation of the machine which has outworn its usefulness is chargeable to the productive process, so it is now considered that the cost of industrial accidents to employees is properly borne by the industry. A somewhat similar philosophy underlies the demand for health insurance legislation now being concurrently urged in several states of the Union.

"A middle course theory reconciles this recent tendency as not out of accord with the ideals of individualism. It recognizes accidents, sickness, and death as capital hazards confronting each individual. Adequate provision for them by the individual is frequently impossible, even with great sacrifice and foresight. . . . Yet, by co-operative action, the cost of such capital hazards may be shared and borne with slight difficulty. This assists rather than interferes with the maximum individual progress.

"Moreover, the American Chamber of Commerce in Berlin which has had an opportunity to see health insurance in operation under government auspices declared that,

"Compulsory workmen's insurance has raised the working classes in Germany in respect to health, economy, and standing in the community, and it is clear that, with their aid only, Germany has maintained her position in the markets of the world. And furthermore, hundreds of thousands, now fighting on the field of battle, may trace their health and capacity to the timely and proper treatment received with the aid of sickness insurance.

"**Medical Profession Deeply Interested.**—The medical profession which is always profoundly affected by any thorough-going system of health insurance has perhaps taken a more active part in the movement in America than has either of the other two directly affected groups already mentioned. This alertness is perhaps due in large part to the manner in which the legislation was presented. Mindful of British experience where the physicians threatened to go on strike against the Lloyd George act (fearing lest their incomes be reduced but learning later in actual practice under the law that their incomes were measurably increased) the original drafters of health insurance bills in this country left the medical sections in merest outline and urged the doctors to suggest provisions acceptable to the medical profession. The American Medical Association immediately accepted the invitation in good spirit and appointed a committee of which Dr. Alexander Lambert is chairman and Dr. I. M. Rubinow executive secretary to investigate and report. Several valuable pamphlets have already appeared as a result of this expert committee's work, and at the annual convention of the American Medical Association in June, 1917, the House of Delegates adopted a resolution encouraging further work on the subject and instructing its Council on Health and Public Instruction to co-operate when possible 'in the molding of these laws that the health of the community may be properly safeguarded and the interests of the medical profession protected.' The resolution also outlined four legislative demands, the greater part of which are specifically met in the standard bill, namely, '. . . insist that such legislation shall provide for freedom of choice of physician by the insured; payment of the physician in proportion to the amount of work done; the separation of the functions of medical official supervision from the function of daily care of the sick, and adequate representation of the medical profession on the appropriate administrative bodies.'

"Such sincere opposition as has come from physicians, and there is not a little of it, can be traced in very many instances to dissatisfaction with medical arrangements under workmen's compensation laws which in most states were enacted without the aid or special

knowledge of the medical profession. There is, fortunately, ample evidence that medical men will not be caught napping when health insurance is enacted, and no less a leader than Surgeon General Rupert Blue in his address as president to the American Medical Association has declared: 'Health insurance is the next great step in social legislation.'

"**Selfish Opposition by Private Insurance Companies.**—Although the exclusion of the commercial insurance element from profiteering in social health insurance follows the tested experience of other countries, and is in line with an unmistakable American tendency as a result of practical experience here with workmen's compensation legislation, every effort to exclude such profiteering in these misfortunes of the wage-earners is met with vigorous and characteristically selfish opposition. It is not too much to say that nine-tenths of the opposition to social health insurance comes directly from men who are in the employ of private insurance companies. Any one familiar with the private insurance propaganda of vilification against the public method of conducting workmen's compensation will, of course, not be misled by similar efforts to confuse the public regarding health insurance.

"**War Conditions Emphasize Need.**—Despite efforts of an interested opposition to throw sand in legislators' eyes there is no doubt about the growing conviction of the public that private insurance has proven itself woefully inadequate to meet the sickness problem and as a commercial venture places an unnecessarily heavy burden upon those least able to bear it. This conviction was already beginning to crystallize into legislation in time of peace. In time of war the needs of our industrial army, which constitutes our first line of defense, very greatly accentuate the urgency of a comprehensive program for the conservation of our human resources. As men are taken by war from shop and factory, those remaining must be kept fit to meet the increased demand for output. And as women enter industry in rapidly increasing numbers, the need becomes even more pressing for the protection afforded by universal health insurance, including maternity care.

"Existing protective standards for labor must be upheld in the interest of national effectiveness. But in addition to that we must make provisions for increasing still further the nation's productive power and the wellbeing of its workers. Healthy wage-earners are the foundation of national strength both in peace and war.

"Unfamiliar work and intense effort due to industrial shifting required by war will increase the toll of sickness among wage-earners, particularly women, as it has in Europe. Workmen's compensation provides the stimulus for prevention of accidents. Under universal

health insurance there would be similar efforts to prevent sickness. It is in the public interest to provide the machinery by which preventive measures against disease will be stimulated and adequate medical attention and cash benefits provided to tide the workers over sickness periods without distress and destitution. Health insurance is social justice. The responsibility for sickness is shared by industry, the worker, and the state, and all three will share in the benefits of public health."

Group insurance, that is, the plan of insuring a body of persons working under the same general conditions and presenting an average of normal health and medium age, is a plan conceived some six or seven years ago and which has been adopted by a number of industries of the country. Group insurance is not offered as a substitution for health insurance, as it deals chiefly with the problems of life insurance. It is purely a commercial plan, but based upon the principle of the employer giving more to his employees and, therefore, getting more from them. In practically every concern where group insurance has been introduced the relationship between employer and employee has improved, due to the reawakened interest of the one in the other.

At times the advocates of health insurance have condemned the group insurance plan and the advocates of the latter have fought the former plan. It would seem that there is good in both and that both ideas should be included in the final enactment of legislation on this important subject.

Health insurance will give the necessary relief to the working man or his family during the period of disability but it will not provide sufficiently for the relief of the family after the wage-earner's death. Group insurance, on the other hand, gives a nest egg to the dependents during that period of readjustment following the loss of their provider but does not afford relief during his term of sickness. Group insurance combined with employees compensation for accidents has already demonstrated the need of some form of life insurance combined with health insurance. And further, death is not always the agency which deprives the family of their support, but premature break-downs, old age and even non-employment have contributed largely to destitution. Thus pension, especially old age pension, is another form of insurance which is as essential as health and and life insurance.

While these various insurance plans are being thrashed out it behooves all commissions studying the problems to make strong recommendations for improved compensation laws in case of accidents, and especially a standardization of the existing compensation acts.

Mr. Whiting Williams has pointed out the need of insuring the workers of the country thusly:

"'Why do the charities need money when we can't get enough men to run our factories?'

"This question came from every side to the writer last year when secretary of the Federation for Charity and Philanthropy. Here is the answer:

"One of the large New York charities said not long ago that more than nine-tenths of all their cases were caused directly or indirectly by sickness, including death of the bread-winner. An investigation of some five thousand families had earlier shown that one-third were of the 'widow type,' the father dead or permanently disabled. Because widows and fatherless children need 'permanent, liberal and regular' relief also, such families require more than one-third of the money secured.

"What had these fathers been doing? Most of them had been factory workers—and it must be remembered that the presence of fatherless children always denotes that the fathers were cut down in their prime. In Ohio and a number of other states industry makes some amend by money awards, where death occurred as the direct result of a factory mishap. But this cares for only about six or seven per cent. of industry's widows and orphans. The others, for the most part, make a burden upon their none too prosperous friends, or compel harassed charity officials to explain why contributions are needed in so-called 'good times.'

"The head of the city's Jewish Federated Charities has pointed out that there is no reason in the world why industry should not pay for its fearful wear and tear on the human machine, just as it 'charges up' the cost of the steel machines it finds it necessary to 'scrap' from time to time.

"The new group insurance is a way of doing this, with the additional advantage that its cost is largely offset by the savings it effects. Without increasing the price of the manufactured product and hence the cost of living, this six-year-old form of insurance utilizes team-work to relieve industry's workers from the necessity of competing with the war's victims for a share of charity's dole, and at the same time operates to increas the productive effectiveness of the factory in its indispensable support of the firing-line."

The group insurance plan referred to by Mr. Williams is excellently described by Mr. W. A. Day, President of the Equitable Life Insurance Society of the United States, who says:

"Group insurance is the name given to a comparatively new development in American life insurance. Its object is to enable the employer, who has under him a large number of workers, to increase the efficiency and stimulate the loyalty of these workers by rendering them a genuine service; the aim and the result of which is to strengthen

mutual good will and make the business relations between employer and employee closer and more permanent.

"The employer accomplishes this by giving to each employee a moderate amount of life insurance for the protection of his dependent family.

"Every life earning a pay check has a definite insurable value. The ultimate aim of group insurance is to cover these values. It is a plan for insurance at its source under which the employer provides the life insurance to protect the pay check. It brings life insurance to a large number of unprotected families who, but for this plan, would continue unprotected.

"Group insurance is based on the principle of co-operation between the employer and the employee, for the benefit of both alike. The insurance is at the expense of the employer only in the sense that the employer pays the premium cost of the same. Experience indicates that increased efficiency on the part of the employee in response to constructive efforts in his behalf fully justifies the cost of the insurance. Group insurance may be viewed as a practical application of social insurance principles in strict accord without American ideals of individualism. In my judgment the group insurance principle by means of which the employer assists the employee in protecting himself against distress in various relations suggests a solution of many of the problems now involved in industrial relationship. . . .

"After the work at fair wage comes the protection of that wage from loss. Such loss may be due to: First, death; second, disability; third, superannuation.

"The measures effective to prevent these forms of distress are, in order: life insurance protection against the loss of the wage through death; health and accident insurance protection against the loss of the wage through temporary or permanent disability; pensions or saving system against the loss of the wage through inability to work because of old age incapacity.

"So far as these plans or any of them can be made to serve on the theory of justifying such additional expenditures by the employer because of additional efforts on the part of the employee, the plans are economically sound.

"Group life insurance approaches the labor problem by recognizing that irrespective of the size of the pay envelope large classes of people will remain who through thoughtlessness or lack of urging, or physical inability, do not themselves provide life insurance for the protection of their dependents. A careful study of our claim figures indicates that perhaps as high as 40 per cent. of the wage-earners have no life insurance. Life insurance is only purchased because of persuasion by an agent. Unless the agent has the opportunity to point out the

necessity for life insurance to an individual, this individual views his obligation in the abstract and fails to make unsolicited application for insurance. Then again there is a certain percentage of those applying for life insurance who do not measure up to the required standards of insurability. If such men applied individually for insurance they would be rejected.

"The group insurance plan contemplates the inclusion of the weaker lives by supporting them by the larger percentage of the stronger lives. Hence, insurable classes are obtained by having the insurance embrace all the employees of any single employer, *who has proper regard for the selection of his employees and for surrounding them with safeguards to health and limb.* Thus the employee may be insured according to the rating for age, occupation and industry without reference to the individual insurability of any particular employee. By this means, the group plan becomes universal throughout the little dominion of one employer.

"A group contract is made with this employer, setting forth the terms, conditions, and rates under which the insurance will be continued. Each employee is given a supplementary insurance certificate written in the name of the employee, stating the amount of the insurance, and giving the name of the beneficiary designated by the employee to receive the insurance if death occurs during continuance in the employ.

"This means the elimination in that particular establishment of any necessity for 'passing the hat' among fellow employees, to care for the survivor of some employee who has died unprotected. It means that a certain sum of insurance will be available in the home on the death of a worker so covered, to supply the money immediately necessary for the funeral, and enough more to serve as a substitute for the wage check during a reasonable period in which to readjust the affairs of the family to the new conditions.

"The amount of the insurance is usually based on one year's wage or salary, with a maximum limit of $3000 to those receiving more than that sum. In other cases the amount of the insurance is some flat sum such as $1000 to each. A third plan is that of graded insurance such as $500 or $1000 to be increased by $100 insurance per year for each additional year of service up to a fixed maximum. These plans are variously adapted to fit the views of an employer as to the needs of his employees, and the ability of his business to provide the premium costs of group insurance to fill these needs.

"That some life insurance is a vital need of the worker, to protect his dependents, is abundantly testified to by statements from employees and from their beneficiaries. One large automobile company carring group insurance has kept close record of the conditions in the homes to which these group policies were paid.

"Out of the first fifty claims that were paid, it was reported that there had been only one case in which the claim money was not urgently needed to prevent immediate distress. In the one case which was an exception the money was used to advantage in paying off a mortgage on the home. Another large employer studied the effect of the claim moneys in over one hundred homes with practically the same result.

"In many of the cases in which those claims were paid, the employees were highly skilled, commanding relatively large pay. Conditions were found to be much the same among the highly skilled and among the lower grades of labor, each class living up to its full income and apparently not finding a place in their budget for a proper amount of life insurance.

"Time will not permit me to reproduce statements from individual beneficiaries, but the following which was sent from the sales manager of a large oil company to the insurance company in reference to a group claim illustrates the good which group insurance does. This letter is in part as follows:

"'The case of Mrs. . . . and her two daughters is the most deplorable one that the writer has ever come in contact with. All three of them are in the last stages of consumption, with not a penny in the house, and the $1000 I handed them was really the most valuable sum of money I believe that ever went into the State of Oregon.'

"Group insurance is not a substitute for individual insurance. It simply supplements it. It is meant to provide some insurance to those not otherwise protected by it, and to be a substantial addition to the individual insurance which all are encouraged to provide for themselves. The plan has been found to work best only as it is operated on an inclusive basis; namely, to include everybody employed, or all those in the class for whose benefit insurance is desired.

"Any attempt to leave the choice with the employee whether he should secure this protection or not, defeats in some degree at least the object of the insurance in its attempt to be universal throughout one group. For this reason it has not been found satisfactory to have the employees pay for the insurance either in whole or in part. Any proposal for payment from the employees entails the refusal of the insurance by some employees, which destroys in the first place the universality of the protection and in the second place impairs the averages requisite in an insurance transaction, because those who would stay out would be as a rule the stronger lives not feeling the immediate need of the insurance. . . .

"It has been urged at times that group insurance might be used to keep down wages or to keep men from freedom of action in changing their employment. This is an erroneous conclusion. Any effort to use group insurance in this direction would defeat its aims and make

the expenditure an utterly wasteful one, because it would fail to improve the industrial relationship on the basis of getting more by giving more.

"One employer, already quoted, goes further than the mere subject of group life insurance by including in his establishment other forms of protection for the employee, and states:

"'I have always believed that the great problem of the employees' unrest must be met more by the voluntary act of employers in removing causes of unrest than through the compulsion of legislation, and that it would create a far more beneficial result in the attitude of labor toward capital if employers generally should extend these benefits voluntarily without waiting for compulsory legislation.'

"It is interesting to note how closely this reference is related to the whole subject of social insurance. It is also interesting to note that this employer now providing voluntarily for his employees' group life insurance and also group disability insurance in larger ways than have been proposed in any system of compulsory social insurance, comes to the conclusion that the distress of the employee must be met, and that the only alternatives are either for the employer to relieve this distress voluntarily, or for the state to compel him to do so. . . .

"The social service of group insurance is self-evident and it is being rapidly extended. It is also clear that social insurance would be but a minor application of relief principles which are now advocated and are achieving increasing vogue through the work of group insurance. Far from competing with such principles social insurance would probably stimulate the further application of group insurance. It may be said that the adoption of Workmen's Compensation Insurance was the most important single item in opening up the field for group life insurance. The workmen's compensation laws have done more than stimulate group life insurance. These laws have also brought into being group health and accident insurance supplementing the compensation laws by voluntarily providing compensation benefits over hours not covered by these laws and otherwise extending benefits to classes of salary workers excluded entirely from compensation laws.

"It is also important to note that group insurance has stimulated the study of the subject of old age pensions by institutions not yet granting pensions, and has had a strong influence in effecting improvements in existing pension systems. The conditions of many pension funds and pension systems foreshadows future disappointment and distress. To find a pension fund well planned, well managed and actuarially solvent is the exception rather than the rule. In the past the advice and services which the insurance companies are able to render, have not been utilized to any large extent in perfecting the pension systems adopted by our large establishments, associations of school teachers,

public servants of various kinds, and even foundations organized for pension philanthropies. The pension systems operated in this country are almost all actuarially insolvent, or in the way to become so unless radically readjusted. Independent of the financiering of the pension the plan under which these pensions have been organized and granted has not always been one that commends itself for justice, simplicity and the complete protection of the pensioner. Group insurance has done much to call attention to the pension subject as a related provision for protecting the employee, and has placed the equipment of experts at the disposal of those concerned.

"Group insurance is no longer an experiment. It is an accomplished fact. It is carrying to the employer a sound principle and the conviction that he can, with advantage to himself, to the employee, and to humanity, co-operate better to protect the worker in ways which bring returns commensurate to both and to society at large."

Some of the best principles thus far suggested, not only as a basis for health insurance, but for our medical and surgical work and other movements looking toward the welfare of employees, are contained in a paper entitled "Human Relations in Industry" by Mr. Whiting Williams. This article can be found in the transactions of the National Safety Congress for 1917, and should be read by every physician in industry.

At the present time the National Industrial Conference Board is making an extensive study of occupational and accident hazards in all industries, the industrial sanitation and accident prevention plans introduced to combat these hazards and the results of medical and surgical work being carried on in industry, with a view to stimulating legislation along the lines of standardized prevention of sickness and accidents. They feel that eight or ten millions of dollars spent in prevention would accomplish far greater results than ten times those amounts expended immediately in health insurance. They argue that health insurance is the cart which is being placed before the horse and that universal prevention at this time is far more important than universal relief measures after the damage is done. Every physician in industry throughout the country will have the opportunity of assisting this association in its investigations and, as their principles are quite in accord with the spirit of prevention, every facility for the most complete deductions should be given them. The entire industrial force of the country is everlastingly in debt to this National Industrial Conference Board for the constructive measures they have introduced into our industrial development during the last five years. Their present investigation should have great weight with all state legislatures contemplating the enactment of health insurance laws.

From a study of the various European plans of health insurance, old age pensions, life insurance and other forms of insurance and from a study of the various plans for similar arrangements in this country advocated by the different governmental and civilian agencies one is convinced that the great desire of all civilized governments is to improve the health and thereby the economic conditions of their working people. Unfortunately some of the systems in vogue in other countries have been too paternalistic or have wrought too great a hardship on industry, or have tended to stimulate malingering, or robbed the medical profession of their inalienable rights, or have stimulated political manipulation. These mistakes give excellent grounds for criticism on the part of labor, or of capital, or of the medical profession, or of other groups of people whenever health insurance legislation is proposed in any state.

Nevertheless, all of these various groups agree that some form of universal insurance is needed. The United States is used to thinking in big terms and mammoth propositions have always appealed to our people. Since we have entered the war we have become accustomed to talking in billions, to see the Federal government assume control of our great industries, to see labor organized as never before for the greatest possible production, to witness the food supply of the country controlled and conserved and to see the medical profession organized into a gigantic machine for the protection of our armies. Having these examples before us we should realize that this is the psychological time to put across the most comprehensive scheme for the betterment of the health and the economic conditions, not only of the working people but of our entire population.

With this in mind, such a program should include:

First, the greatest freedom in the industrial development of our country from both the standpoint of capital and labor but with the necessary governmental supervision over the human relationship between each that would forever eradicate the wasteful warfare which has been waged between them in the past.

Second, establishing at once a nation-wide program for the prevention of disease and accidents, not only in industry but in every walk of life.

Third, the immediate federalization of the health agencies of the country with the necessary adjuncts to carry out such a program. If the present great medical machine which has been built up for military purposes is allowed to disband the greatest opportunity for a system of socialized medicine will have been lost. The great machine for food conservation which has been formed is one of the well-organized adjuncts necessary for the above program. Safety and sanitary engineering have entered into the activities of the government as

never before during this present emergency; these also are essential auxiliaries in a comprehensive health plan.

Fourth, a scheme which would provide for:

(*a*) The necessary financial relief or compensation in case of disability for every essential producing person in the country.

(*b*) The necessary funds to be raised by compulsory contribution prorated between the employer, employee, the individual and the state; the premium rate to be arranged on a sliding scale, assessed annually, and based upon the amount of sickness or the accident rate occurring among each group during the preceding year. Thus the contribution from the employer would depend upon the size of his working force, plus the sickness and accident rate among them. The contribution from the employee would depend upon his wages, plus the sickness and accident rate among the employees in that particular industry. The contribution from the individual would depend upon his individual income plus his personal sickness and accident rate. The contribution from the state would depend upon the insured population plus the reduction or increase in the sickness and accident rate. Such a plan, affecting as it does, the pocket-book of every individual would be the greatest incentive for prevention that could be conceived.

(*c*) A cumulative fund raised from a premium rate, slightly in excess of that needed for health insurance and to be used as insurance against old age, non-employment and death.

(*d*) The necessary medical and surgical relief to be given by that branch of the medical profession assigned to treatment.

Fifth, the medical forces of the country would be divided into teaching groups, prevention groups, and treatment groups. Subdivisions of these divisions would include executives, consultants and field workers. Compensation would be paid from the fund raised for insurance and would be commensurate to the average fees received by physicians under the old plan of individual practice. Great fortunes would no longer be made in the practice of medicine; neither would our great scientists, devoting their time to research work, go underpaid as in the past. Incompetents in the profession who have gained wealth by quackery methods or who have remained poor because of their incompetency would be eliminated. Medical science would become standardized and a better system of medicine would be universally practiced. Every section of the country, and every district in that section, would have its qualified medical forces. Wastage, as at present, from duplication of effort would cease.

Such a comprehensive plan as the above would have been con-

sidered the dreams of an idealist before this war, and by many may still be so considered, but the war has advanced every social reform a hundred years. To-day it behooves the thoughtful man, both in and out of our profession, to take for a standard the most ideal plan that can be conceived and from it to work out a practical solution of these problems. These are the by-products of the war which will make worth while the great sacrifices which are being made by our men to-day on Flanders Fields.

CHAPTER XLVI

EMPLOYEES' MUTUAL BENEFIT ASSOCIATIONS

Employees' Benefit Associations represent a form of industrial insurance long in existence in this country. This form of protection was sought for and organized by the workmen themselves. As these associations grew in favor and demonstrated a real economic function, employers began to encourage them by contributing to their funds or by co-operating in their management.

To-day over 500 Mutual Benefit Associations, scattered through an equal number of industries the managements of which strongly support them, testify to the value of sick benefits for disabled employees. Their greatest economic value, however, has been to focus the attention of the country upon the need of a state-controlled system of health insurance.

The development of employees' benefit associations in this country has had a very close relationship to the development of industrial medicine. It is desirable, therefore, that the physician in industry should become familiar with these organizations and whenever possible stimulate their growth.

The author is greatly indebted to **Mr. W. L. Chandler,** one of the greatest authorities in this country on this subject, for the following article on Employees' Benefit Associations:

"The form of Mutual Benefit Associations which has developed during years past is known to employers in a general way. In the past each group of employees has been working out its own salvation, determining upon amounts of benefits and dues in keeping with their particular requirements. Originally these were organized by the employees. Of recent years the employers have come to recognize their value not only to the wage-earners but to the corporation, and as a result of that feeling together with the growing tendency of employers to take more interest in the welfare of their men, there has come to be a co-operative spirit in the management of these associations, which pay daily benefits in case of disability from either sickness or accident and final benefits in case of death.

"**Three Different Forms of Organization.**—The relative values of the three forms of organizations are best reflected in the following figures, taken from a report of the Commissioner of Labor:

"Of more than 400 organizations in the United States those operated

solely by employees enjoyed an average membership of 30 per cent. of the employees eligible for membership. In organizations where employer and employee co-operated in the management the membership averaged 66 per cent., while in those associations managed entirely by employers the membership averaged 75 per cent.

"In spite of these figures, 75 per cent. of the Associations, according to the Government, were managed by employees alone, 18 per cent. were managed jointly by employer and employee, and 7 per cent. by the employer alone.

"The present tendency is toward co-operation on the part of the employer. Associations which have been organized in recent years are nearly all co-operative. By failing to co-operate with an effort of this kind among his employees an employer is in reality withholding from them the benefits which they might obtain through his advice and counsel. It is assumed that the employer by virtue of his broader business experience is able to offer advice of great value to the men.

"**How Should Membership be Obtained—Compulsory or Otherwise?**—The compulsory form of membership unquestionably produces the highest percentage of members. Observation of a number of Associations operating on that plan has shown several serious weaknesses in the plan. Every item of a compulsory nature which is injected into an establishment has the effect of increasing friction between the employer and employed.

"Some employees have outside insurance. Others have reasons for not wanting to join such an organization. These naturally resent compulsory membership. There is another type of man who needs the protection and could be led to join the organization, but the moment he is coerced he is immediately antagonized, feeling resentful toward the association and the employer.

"Still greater evil in the compulsory membership plan comes from the fact that the time keepers or other clerks who administer the benefits or collect the dues unconsciously develop habits of autocracy, which inevitably manifest themselves in their remarks and actions. These things very quickly increase any tendency to friction between the employer and the working force.

"**Voluntary Membership Should be Followed.**—The next thing is to develop selling plans which will lead to 80 or 90 per cent. of the employees becoming members. This can be and is being done in many institutions. The one most effective selling plan is to secure the co-operation of the employment manager and foremen. When a man comes on to a new job is the psychological moment to get his membership. One essential in a case of this kind is to have an enthusiastic membership, so that any inquiries on his part will result in favorable response from fellow workers. To secure this the member-

ship must be in mind also to keep them informed of the favorable progress being made.

"Some corporations have offered bonus plans to departments securing a satisfactory percentage of membership. These have not seemed to work out satisfactorily because of the difficulty of administration.

"**Benefits and Average Cost to Employees.**—While the cost is of the most interest to employers and employees, the amount of dues must necessarily hinge upon the amount of benefits paid to members. Statistics covering about 600 organizations show that one dollar ($1.00) per day for disability due to either sickness or accident, beginning on the fourth day after disability begins and continuing for not to exceed thirteen weeks, is by far the most popular form of benefit. Under present wage conditions it seems inadequate. Using this benefit as a basis of calculation, it develops that with about 350,000 members the cost for such benefits should run less than ten cents per week, allowing a factor of safety of about one-third.

"Coupled with the disability benefits we almost invariably have death benefits of $100.00. Such a death benefit calls for weekly dues of two and one-half cents (2½¢.). These two benefits combined produce a total of twelve and one-half cents (12½¢.) per week. The amount of benefits may be varied greatly to suit different conditions. The cost should be in proportion provided the membership is representative; that is, that it embraces at least 70 per cent. of the number of employees and that there are in the association 200 or 300 members. The organizations of 500 members are able to benefit from the experience of the wider average of members.

"Rather than to allow the secretary or other official of the association to collect dues by calling on the members, most of which would be done on company time, it is far better for the employer and immensely more successful for the association to have the dues deducted from the pay, the member signing an order on the paymaster for that purpose. This has been found to be practically the only successful way of collecting dues.

"**Employer's Contribution.**—Employees do not look for and it seems unwise for an employer to make contributions to an association of this kind. Such contributions immediately give rise to wonderment as to the motive behind them and frequently result in unfavorable impressions. Any contributions on the part of the employer should be made in the form of his co-operation in an advisory capacity and by permitting one or more employees to devote such time as may be required to the intelligent conduct of the work. The average mind does not recognize such as a contribution on the part of the employer. Such an employee may be of inestimable value to the association and accordingly to the employer.

"**Forms of Benefits.**—In a very few of these associations it is customary to make the benefits a given percentage of the wages. That plan offers some advantages, but on the other hand there are many disadvantages due to obstacles encountered in administration. The calculation and deduction of dues each week or pay day involves a good deal of clerical work and chance for error, and it is generally considered that the fixed amount of benefits and dues are preferable.

"Some organizations provide for different amounts of benefits and corresponding dues to take care of those members who realize the value of the protection. Sociologists and others who have carefully analyzed the situation have reached the conclusion that benefits should begin on the fourth day following the beginning of disability. This eliminates that large number of cases of one, two and three days duration. Cases of three days do not involve a member in any financial embarrassment but what he can overcome. If benefits were made to include these three days of disability the large number of short time cases would prove a very heavy drain on the treasury and result in much higher dues being necessary to carry the insurance. After all, the benefits are purely a matter of what the men are willing to pay for. It is unwise though to select benefits which call for dues so high as to prove unattractive.

"Some associations have a plan in force whereby members disabled for more than two weeks receive benefits for the first three days as well. This is a bad practice, because it is equivalent to offering a bonus for prolonged sickness. For example, if a member is sick a little less than two weeks he will be very quick to realize that if he will only pretend sickness for the balance of the two weeks the association will not only pay him the benefits for those few days but in addition will hand him a bonus of benefits covering the first three days of disability.

"Benefits are regularly paid for thirteen weeks covering either sickness or accident. Work accidents as well as those occurring outside of the plant are almost invariably included. In the cases of men drawing compensation it sometimes happens that members are receiving benefits in excess of wages. This will result in malingering unless something is done to counteract the influence. A provision in the By-laws where benefits from all sources shall not exceed 90 per cent. of wages has been successfully used in the association among employees of the Dodge Manufacturing Company.

"In the case of salaried people benefits under this plan cannot begin until salary ceases. In cases of compensation for injury the Indiana law provides for 55 per cent. of wages after the first week. The association pays full benefits for the last four days of the first week and the difference between 55 per cent. and 90 per cent. thereafter,

provided it does not exceed the amount of insurance carried by the member.

"**Free Medical Care.**—One very live topic among organizations at this time is that of free medical care. There seems to be very little in the way of crystallized opinion on that subject, although something definite should result from so much thought being applied to the subject.

"In cases where employers have industrial physicians attached to the plants certain medical care has been given, but in all of these cases the disposition seems to be to make this a contribution of the employer rather than of the association. It remains for some industrial physician to evolve a plan whereby such associations may render medical assistance to members without encountering the disadvantages which have so far led to failure wherever attempts have been made.

"**The Human Side of Employees Benefit Associations.**—A well handled organization may be made the means of many other self helps for employees. Going back to the case of loss in production due to worry of the workers. We may consider the cases of men worried over their debts as well as over sickness. The more these men are worried the less 'pep' they have and the lower production drops.

"I recall one case of a man who borrowed $80.00 of a loan shark, and after paying $1.00 per week for eight years he still owed $47.00 of the loan. This matter was brought to the attention of the officers of the E. B. A. Investigation showed that these loans had been made each month for thirty days and that interest and renewal charges had almost eaten up all that he paid in, which accounted for the condition of the account.

"Another man received $55.00 from a loan shark and gave his thirty day note for $60.00. At the end of the month he attempted to pay $5.00 on the principal. He discovered, however, that it would cost him $3.00 to renew the remaining $55.00 and that the interest for the thirty days amounted to $2.00, so that it took all of his $5.00 payment to make up the interest and the renewal charge; consequently, he still owed $60.00 after paying $5.00. This had continued for twelve months. Each month he had paid $5.00 without making any impression upon the note. This was also brought before the officers of the same organization. In the first case the matter was placed forcibly before the shark and the man was told to refuse further payment and that the E. B. A. would see him through in case of trouble. In the second case, arrangements were made to take up the loan and handle it upon a more just basis through another medium.

"Unfortunately the human being is not normally gifted with the ability to accumulate money. The thrift habit seems to be absolutely

an acquired taste, requiring pretty strong incentives to develop it. Every person has occasional need for cash in excess of that on hand. These cases may be at the time of moving, buying furniture, putting in the winter's coal or potatoes, in case of sickness, childbirth, death, etc. Regardless of the cause, some proper method of satisfying the need must be created if an employer is going to prevent the disastrous results among his workers which will surely follow if they get into the hands of loan sharks.

"Experience shows that these money lenders are often found right in the plant. Some foremen have been found to conduct loaning schemes with very injurious results, so that they often exist where we least suspect them.

"An employee who finds it necessary to frequently borrow money somewhere back in the rear of his head has a notion that he is not paid sufficiently to permit a proper living. It is among such men that labor agitators find a very fertile field. A man who has not developed the thrift habit will never be out of debt, no matter how much his wages amount to.

"We are now up to the point of developing a vision for the man. We must bring him to a point where he wants something and wants it very much and where he can see that by systematic saving he may be able to secure the thing he thus desires. If we can bring him to see the value to himself of a bank account he will do the rest. He must have more than a hazy glimpse of money in the bank. He needs a firmly implanted vision of the nearness of the things he wants so that he will not look upon the task as a hopeless one. If he ever gets such a vision you cannot stop him.

"To bring this situation about the E. B. A. should be induced to add to its activities the function of a Thrift Club. On account of legal technicalities it may seem desirable to go through the formalities of a separate Club, electing the same officers as those for the E. B. A., so that the work of the two may be handled without the need for separate meetings.

"These Thrift Clubs are doing wonderful work in teaching men to make ends meet, instilling the principle of Thrift into the remotest corners of the plant. One man who had been in debt for fifteen years and honestly believed that he did not receive enough to permit him to live decently has demonstrated not to others but to himself that he is able to get out of debt and in time to pay for his home. Many of these cases are very touching and provide the greatest amount of encouragement to those who are instrumental in promoting such Thrift Clubs.

"**The Employees' Benefit Association in Preventive Work.**—In endeavoring to reach employees with any new line of thought it is

necessary to begin on the plane in which they are in the habit of thinking. For example, imagine a manufacturing plant where the toilet facilities have been left pretty largely to each department to look after and nothing out of the ordinary provided in the way of toilet rooms—no tile floors or walls, merely ordinary kind of janitor service, etc. In a great many cases it has been shown clearly that under such circumstances these toilets will be quite unsanitary; in fact, to one who has been accustomed to properly maintained toilet facilities they are especially offensive.

"A physician entering such a plant would naturally be very unfavorably impressed with the toilets, and his first desire would be to clean them up, buy new and modern equipment and to insist that they be kept in a highly sanitary condition. Such toilets would fail absolutely because the employees have grown accustomed to the kind they are using and, in fact, such toilets really reflect the minds of the majority of the men who use them; otherwise, they would be more sanitary. Before those toilets can ever be fully sanitary and maintained in that condition the material make-up of the men must be changed.

"This illustration I am applying to toilet facilities has a similar bearing upon any phase of health movements. A physician desiring to improve the condition of men in a plant will then find the most valuable assistance in the Employees' Benefit Association. This organization is of, by and for the employees. They have certain needs and have learned to recognize their problems. A physician by beginning with their viewpoint will find that they are much more ready to follow his teachings than if he starts with any other point of view.

"As a side light on the value of preventive medicine to the employer, there is in mind an instance in a large plant during the Influenza Epidemic of 1918. This employer called together all the departmental foremen to listen to a talk by the physician. In this talk they were informed of the various symptoms by which they might recognize certain possible victims of the epidemic. After the physician had finished the foremen were instructed to keep their eyes open for workers who showed any of these symptoms and that such be immediately referred to the medical department. As a matter of fact, only about one-third of those referred for examination proved to have influenza or anything which might lead to it, so that only one-third were sent home and given medical treatment.

"The illuminating part of this instance develops through one foreman who did not co-operate. A week or two after this particular foremen's meeting it developed that the plant was in rather favorable condition except one department and that was nearly shut down because so many of the employees were sick with influenza. Investiga-

tion disclosed the fact that this foreman thought that precautions of this kind were unnecessary, so he paid no attention to the instructions, preferring to keep a man on the job as long as he could stick. He had made no effort to watch his men, allowing them to do as they pleased about coming to work. When the management discovered the real situation it became necessary to thoroughly fumigate the whole department and to make physical examinations of everyone in it who was not yet sick, sending home those who showed symptoms. The loss in production in that department was exceedingly great for the following two weeks. The contrast between this department and the others was very conclusive evidence of the value of this preventive medicine.

"On the whole, the interest in Employees' Benefit Associations is growing constantly. Corporations throughout the country are encouraging employees to form organizations of this kind and are co-operating with them to increase the membership. Evidence is conclusive that they have proven a real asset to the employer wherever installed."

PART VI
RECONSTRUCTION

CHAPTER XLVII

AMERICANIZATION OF THE FOREIGN EMPLOYEE

THE INDUSTRIAL SURGEON'S PLACE IN THIS PROGRAM

Another great benefit of the present war has been the awakening of our nation to the fact that a large proportion of its citizenry is composed of foreigners who have never become americanized. We have welcomed these immigrants to our shores but have made no concerted, national effort to assimilate them. Content with the knowledge that in one or two generations they would become good Americans, we have allowed the recent arrivals to live, think, eat, drink and act as foreigners.

The great number of naturalized foreigners who still gave their full allegiance to the home country has awakened us to our shortsightedness in this connection. The Bolsheviki movement in Russia was augmented, more than is generally known, by the peoples from that country who lived in our midst for years as radicals and anarchists and then were allowed to return to Russia to spread the seeds of discontent and even of hatred of the United States throughout the ignorant, dissatisfied radical element of Russia. Our failure to americanize these peoples places a part of the responsibility for Russia's downfall upon our shoulders.

These facts are awakening the nation to its duty toward the large foreign population which dwells in the land. Whether we have sufficiently learned our lesson to profit by it remains to be seen.

Already the army has done excellent work in making real citizens out of the foreign draftees. Such men as Taft and Roosevelt have stirred the country by their pleas for a united American citizenry in the future. The Carnegie Foundation has recently given a large sum of money for the creation of a permanent organization whose functions are best described by its name—"Study of Methods of Americanization." These efforts are prophetic of the changed attitude of the country.

The medical profession, and especially those physicians who are

connected with large industries, come in very close contact with this foreign element; see them at their work and at home; and realize more than most people the needed reforms in order to make the immigrant more nearly like the remainder of the population. It is imperative, therefore, for the physician to take a prominent part in this americanization program and to point out to industry, the community and the state their responsibilities and the corrective measures needed.

How many times has the physician in industry been confronted with cases similar to the following:

John Zurowsky had worked for his concern four years. He was a good, faithful employee, but had not advanced because he could neither read nor write English and spoke it very poorly. His foreman noticed that John was looking badly and had lately fallen behind in his work. He was, therefore, sent to the doctor's office.

A nurse who talked John's language learned that his wife and one of his children were very sick and John had been up nursing them at night for several weeks. They had been treated by four different doctors until all of his savings were spent. Then he had taken his child to the free dispensary and sent his wife to the County Hospital. The doctors at the hospital had advised an operation, but as no one there could talk to her she insisted on coming home. The child might have been helped at the free dispensary but the mother was not able to take her there and the father had to work in the daytime. For the last month he had been giving them "Easymon" which a neighbor said was a sure cure, and showed him a Polish paper which also extolled the medicine. In spite of all this his wife and child were growing worse.

The plant physician and the nurse visited John's home at once. He lived in a squalid, foreign neighborhood, in a flat—third floor, rear.

There were five children, the oldest aged ten, and John and his wife living here in four rooms. The rooms were filthy because, as John explained, the children mussed them up during the day even though he cleaned up good at night. The windows were tightly closed and sanitary conditions were of the worst.

The wife was examined and found to have an inoperable cancer of the uterus. This was undoubtedly found at the hospital but when she left no agency of the county saw fit to follow up the case. The cancer could not have been diagnosed by any one of the four doctors who had treated her, as none of them had made an examination.

The child was found to have a pulmonary tuberculosis which had evidently not been diagnosed on the one visit to the free dispensary.

The conditions in this home were explained to the management and the doctor was told to spare no expense in helping them as far as possible at this late stage.

John's wife was sent to a hospital where she occupied a bed in a two-bed ward. The entire history of the case was told to the nurses and they were stimulated to exert themselves to the utmost to make amends for the poor woman's past sufferings. She was kept here until her death six weeks later.

The child was sent to a tuberculosis sanatorium, the expenses being paid by the management, and, after a year, recovered.

A small house in the suburbs, which rented for exactly the same sum that John had been paying, was found for the rest of the family. His wages were increased so he could afford to employ a housekeeper. An American woman was found for this position and she was a marvel in americanizing John and his children.

The lessons which this foreigner's case point out are characteristic of hundreds of thousands of other immigrant employees in the various industries of the country to-day. These can be summarized as follows:

1. Different standards of living in his foreign home.

2. Crowding into a tenement in that portion of the city where those of his own nationality had congregated.

3. No incentive to learn our language or our standards of living.

4. Inadequate wages to provide proper food and proper living conditions for his family.

5. Ignorance of our language and our customs prevented proper treatment of his wife's condition. (The four doctors' failure to examine her prevented an early diagnosis of the case.)

6. Insanitary surroundings caused his child's tuberculosis.

7. Finally, interest on the part of his employer enabled the correction of all these conditions—except that this interest came too late to save his wife.

The problem of the immigrant employee is the problem of industry and of the community. The medical staffs in industry and the municipal public health services can render the greatest assistance in solving this problem.

The existing national emergency has demonstrated, however, that this is a national problem and one which the Federal government must tackle. National health and educational commissions are necessary to properly cope with the situation, not only for the foreign-born citizens but for the native American; the war has demonstrated the extent of illiteracy among our people.

Miss Linda James of the executive staff of the society for the "Study of Methods of Americanization" has made the following contribution to this book in which she most forcibly expresses the part which industrial medicine can play in these problems of the immigrant employee.

"The immigrant has come to play such an important part in the

life of our nation to-day that it has become necessary to give special attention to the problems which he has brought with him. Among these is that of his relation to the industrial world. While probably all manufacturers are conscious that they employ numbers of foreigners, a few figures may make more evident the importance of giving special consideration to this group in industry to-day.

"In 1908–1909 the United States Immigration Commission made an investigation of 'Immigrants in Industries' which contains much valuable material for the industrial physician. It has been condensed by Jenks and Lauck in their book[1] from which the following quotations were taken:

"'It was found that only one-fifth of the total number of wage-earners in twenty-one of the principal branches of industry were native white Americans, while almost three-fifths were of foreign birth; 17 per cent. were industrial workers of the second generation, or of native birth but of foreign father, and 5 per cent. were native negroes. About 30 per cent. of all the females, as contrasted with only 14 per cent. of the men, are native born of foreign father.

"'Altogether, fifty-six distinct races appeared in the working forces of the mines and manufacturing establishments included in the recent comprehensive inquiry of the Immigration Commission. Thirty-seven of these races were of the south and east of Europe or of the Orient. Almost one-half of all the wage-earners were from southern and eastern European countries.

"'The proportion of foreign born among the operative forces of the principal branches of manufacturing and mining were as follows:

"'More than one-half of the iron and steel workers, employees of oil refineries, slaughtering and meat-packing establishments, furniture factories, leather tanneries and finishing establishments, woolen and worsted goods, and cotton-mill operatives; about two-fifths of the glass workers; one-third of the silk-mill operatives, glove factory employees, and cigar and tobacco makers; seven-tenths of men and women garment makers; more than one-fourth of the boot and shoe factory operatives; four-fifths of the wage-earners in sugar refineries.'

"According to the United States Census of 1910, 59.9 per cent. of the foreign born in this country were between the ages of 15 and 45 years.[2] This means that a large part of the immigrants spend at least one-third of their lives in the industrial world; consequently the problem of assimilation is an industrial as well as a community one.

"Ignorance and lack of understanding of English are important factors to be considered in discussing the relation between the

[1] "The Immigration Problem," Jenks and Lauck, 1917 edition, pages 148–9.
are made:

[2] 13th Census of the United States, 1910, "Population," Vol. 1, page 307.

immigrant employee and industrial medicine. That many accidents are due to these causes is an accepted fact. Testimony in this regard is especially plentiful from the mining fields.[1] Their relation to industrial disease is not so well established. It is entirely reasonable to suppose, however, that certain poisons, like lead for instance, would be a more serious menace to a foreigner who could not understand its dangers than to a native American who can comprehend cautions and directions. As an industrial health inspector I have run across numerous instances of this kind. Of the 246,673 foreign-born employees included in the Federal investigation only 53.2 per cent. spoke English; 38.6 per cent. of the 34,957 women and 55.6 per cent. of the 211,716 men. Of the incoming immigrants for the five-year period preceding the study 28.6 per cent. were English speaking.[2] An industry that hopes to lower its accident and industrial disease rates must then give consideration to the question of illiteracy among its foreign employees.

"In addition to the illiteracy of the more recent immigrants from southern and southeastern Europe has come the question of standards of sanitation which they bring with them. Most of these people are peasants direct from the farms of Europe who know nothing of urban and industrial conditions and demands. The condition of their homes and their manner of living are much below the accepted American standards.[3] Consequently the general sanitation of any plant is lowered by their presence unless measures are taken to teach them our standards.

"The housing of the foreign employees outside the plant is another factor to be considered. When those who are used to farm life and who have low standards of sanitation are herded together in tenements, or in old houses formerly occupied by single families, unhealthful results can be expected. In the more recent immigration it is the young unmarried men who come alone first, bringing over their families in the later years. This is especially true among the Greeks and certain of the Slavs. The communal system of living developed by these single men leads to serious overcrowding. Thirty-four per cent. of the 15,127 households of the foreign born included in the Federal study had seven or more persons per household, as against 13.8 per cent. of the native born of native parents; 9 per cent. had ten or more per household, as against 1 per cent. of the natives. Over three

[1] "The Immigration Problem," Jenks and Lauck, 1917 edition, pages 201, 477–9.

[2] 13th Census of the U. S., Vol. I.

[3] "Our Slavic Fellow Citizens," Balch, Emily G.; "Russian Life in Town and Country," Palmer, F. H.; "The Slav Invasion and the Mine Workers," Warne, F. J.

people to a bedroom was a common finding among these foreign-born households. Thirty-two and nine-tenths per cent. of the 15,127 households kept boarders; only 9.9 per cent. of the native born kept them.[1] The diseased immigrant living under such conditions is a menace to the community and to those living and laboring with him.

"The food habits of the foreigners in the old world and the new are also of interest to the industrial physician. The southern Europeans seem to find it hardest to adapt their diet to the demands of our northern climate. Rickets among the Italian children—with the attendent underdevelopment which that means for the adult—is a common finding by nursing associations and hospitals. That industrial physicians are thinking about food in relation to the health of their immigrant employees is evidenced by the fact that out of 70 questionaires recently returned from them, 17 per cent. mentioned this as a distinct problem.

"Racial drink idiosyncrasies are an industrial health problem also. Certain races (the Italians, Jews and Greeks), though they drink, do not get drunk; while others (the Irish and French Canadians) are noted for heavy drinking. It is interesting to note in this connection that the death-rate from tuberculosis among the Irish leads all other nationalities. Industries employing chiefly Irish and French Canadians have had to accept the absences from work on Mondays and even Tuesdays because of the Sunday sprees.[2] Some plants have endeavored to stop drinking of intoxicating liquors during working hours, with its consequent lowering of efficiency and accuracy, by providing at cost other drinks in various parts of the building. Cocoa, coffee, milk, soft drinks, etc., have met with favor and with some degree of success.

"The medical care which is available to the immigrant and his family—with its effect on the working capacity of the employee—is the last point I shall speak of. One industrial physician has described the present situation as 'highway robbery for the employee.' And so it is. A first class doctor cannot be called in by the employee for sickness of himself or his family because of the expense; even a second class one charges a fee out of keeping with the income of the worker. Such a thing as a family physician is seldom found among the foreigners. They shift from doctor to doctor on the advice of neighbors; or what is worse resort to quacks and patent medicines for rapid and cheap cures. A survey of the quack medical advertising to be found in foreign language newspapers gives one an idea of what a flourishing business this is among the immigrants. As a last resort the employee may call

[1] "The Immigration Problem," Jenks and Lauck, 1917 edition, pages 505 and 507.

[2] "The Greeks in America," Burgess, Thomas.

on some charitable organization. This means that more days of work are going to be lost through illness of the worker or his family than if competent and moderate priced medical care were within his reach at the beginning of illness. Whether this is a problem for industry to solve, for the community, or for both to solve together remains to be seen.

"In conclusion there are certain important questions which I would like to leave with the industrial physician for his further consideration:

"1. How is industry going to eliminate industrial accidents and diseases which can be attributed to the foreign employee's ignorance and lack of knowledge of the English language?

"2. Is education advisable; and if so, should it be carried on by the industry, by the public schools, by private organizations like the Y. W. or Y. M. C. A., or by some other method?

"3. Are posters and literature in foreign languages relating to accidents, industrial diseases, sanitation, and personal hygiene going to be valuable in bettering the health of the employee and his family?

"4. What is the responsibility of industry toward its immigrant employees and their families in regard to the following: Medical care during illness of either the worker or his family; food, at home as well as in the plant; drink; personal hygiene; and housing?"

CHAPTER XLVIII

HUMAN CONSERVATION AND RECLAMATION OF THE DISABLED

Physical reconstruction, rehabilitation, functional re-education, occupational therapy, vocational re-education and similar terms have either sprung into existence or derived a new meaning during the present world struggle. The hundreds of thousands of disabled soldiers returning to civil life have made it necessary for the nations to devise plans for their reclamation. As a result a new viewpoint has been attained by the medical profession, by various educational agencies, by both industry and labor, and by many legislative bodies—a viewpoint which must be moulded and adapted to the reclamation of the disabled in civil life.

The United States, following the example of other warring nations, has adopted a plan to physically reconstruct, functionally re-educate, and completely rehabilitate all of her disabled soldiers. Congress, in June, 1917, pledged this service by passing the War Risk Insurance Act. The necessity of conserving our man power, as well as the debt which the nation owes these disabled soldiers, makes such a program obligatory.

By physical reconstruction is meant the continued and complete medical and surgical treatment until the greatest possible restoration of the disabled parts has been secured. Functional re-education consists of various methods to restore function in a disabled part, or to train other members to new work, or to teach the amputated cases the use of artificial appliances. In other words, it is combining with our surgical procedure, which aims at his physical repair, certain other therapeutic measures which will help the patient to functionally overcome his handicap. Occupational therapy is the use of some form of work which will bring into action certain muscles and members of the body thus assisting in their functional restoration, or which will keep the mind and body busy during the long period of convalescence and thus prevent hospitalization and habits of idleness.

Rehabilitation, or the refitting of the disabled man to an independent economic position in society, consists of measures which are neither medical nor surgical but which can often begin during the course of his medical treatment. Thus, the work of rehabilitation laps over into the hospital treatment and, in many cases, continues for an

indefinite period after the work of the physician has been completed. In the majority of cases the functional re-education, especially the occupational therapy, can be made so practicable that it will dovetail with the rehabilitation.

No matter how honorable the wound or the disease that incapacitates one, no man likes to be classed as "disabled." It sounds too much like being "put on the shelf." In warfare a certain percentage of the soldiers is bound to become disabled; very few need remain so. The number of disabilities sufficiently serious to place a man in the discard are very rare. Practically every man, no matter how handicapped he may be, can come back. In fact a handicap puts more fight into a man, makes him strive harder than ever before, and results quite often in his making good to a greater extent than if he had never been disabled.

A soldier who lost both legs recently said: "Watch me! I am going to make good with both feet." And he has. This is the spirit! Determination and grit—stick-to-it-iveness—are the qualities which every disabled man must have or must acquire in order to crawl out or jump out of that despised category—the crippled. As long as the brain power of a man remains, enabling him to will, to choose and to persevere in effort, he is a long way from being a permanent cripple or a permanent invalid.

One is crippled only to that extent to which he allows his physical handicap to put him down and out. If he ceases to be an economic factor in society—an earning, serving unit—he is a cripple. But if in spite of his handicap he overcomes his disability, trains himself for work and becomes a productive citizen once more, he is no longer classed as a cripple.

A man living in Kansas, who had been confined to his bed for years, the result of a form of paralysis, had become the owner and superintendent of a large publishing business. He was a printer formerly. When asked to describe how an invalid in his condition could accomplish so much, he said: "I am not an invalid: I am a business man." His advice was that no matter how permanently disease ties up the body, keep the mind alert and active. Make it work for you. Become independent. The man who gives up to his disabilities is an "invalid;" the man who overcomes them is a force.

As a nation we have failed to teach such ideas as these to our boys and girls. We have failed to help our citizens, who have become permanently handicapped, back to the road where they can go on by their own initiative. Too often the disabled man has passively accepted his fate, and his friends have allowed him to loaf, or to accept a position where no incentive or future existed, such as the proverbial watchman. These cripples and invalids, seeing the money made by professional

beggars, have even drifted into that class. Every nation in this war has awakened to the fact that some men with the worst kinds of handicaps have become successful, useful citizens. Therefore, why cannot all men, and especially the soldiers disabled because of war duty? So with one accord these nations have provided the means of reclaiming their disabled soldiers and of giving them proper training for the future in order that they may make good by their own efforts.

The medical department of the United States Army at the very beginning of this war made plans for reclaiming these soldiers. After other wars our country provided soldiers' homes for many of the disabled, or provided pensions to help the crippled man eke out a living at some mediocre job. The soldiers and sailors of to-day would not be satisfied with such an arrangement. They have made the great sacrifice for their country in her efforts to give liberty to the world. Their country, therefore, must provide a future of liberty and independence for them. Thus the government has evolved excellent plans for the physical reconstruction and rehabilitation of disabled soldiers and many are receiving the benefits thereof.

There is another soldier, the industrial soldier, the soldier of the second line of defense, the great industrial army which is just as essential to the winning of any war as is the military army, and the man who becomes disabled and wounded without the glorification that comes from such wounds when received on the battlefield. Our nation must recognize the rights of these disabled men from industry and provide for their reconstruction and rehabilitation likewise.

PHYSICAL RECONSTRUCTION IN THE ARMY

Before discussing the reclamation of the industrial disabled a short résumé of the physical reconstruction work in the army will give a clearer understanding of this phase of medical and surgical work and its relationship to complete rehabilitation.

It has been difficult to make many of our people, both laymen and physicians, understand that physical reconstruction and rehabilitation are not entirely new departures in the treatment of sick and wounded. Boiled down to simple language, however, this work simply means that every soldier disabled by disease, accident or war wounds must be cured and made fit for work. To accomplish this continued medical and surgical care must be given until his disability is cured or the maximum improvement attained; during this treatment every therapeutic adjunct such as physiotherapy, occupational therapy, curative work and any other agency capable of hastening recovery must be employed; and for those whose handicaps unfit them for their old occupations some form of vocational training must be given, preferably starting during their convalescent days and continuing as long thereafter as is

necessary to refit them for an independent existence. All of this is done for the purpose of returning every disabled soldier to civilian life once more as a productive, economic unit able to carry on by his own physical powers, or, if this is impossible because of the nature of his handicap, then by his mental powers.

Thus it is evident that the medical and surgical treatment involved in reconstruction is not new, except perhaps that the value of certain therapeutic adjunts has been emphasized. But an absolutely new viewpoint for the majority of physicians and for the laymen in general has been injected into the practice of medicine, namely—*all standards of treatment in the future must be judged by the economic end-results obtained.*

It was realized that if permanent good to the nation was to result from these reconstruction efforts this new viewpoint must be spread broadcast throughout the land. Not only must physicians be imbued with these principles, but industry, labor, all educational agencies, and the entire civilian population must be made copartners in this great work. Therefore, the Surgeon General's Office started a nation-wide educational campaign on the reconstruction and rehabilitation of the disabled soldiers, constantly pointing out the application of these principles to the civilian disabled. This publicity work was greatly enhanced by similar propaganda sent out by the American Red Cross, the Federal Board of Vocational Education, the American Red Cross Institutes for the Crippled and for the Blind and by several states through their Departments of Industry and Labor.

Fig. 202.—By means of the whirl-pool bath, a cold, clammy, swollen limb becomes red and warm. Frequent repetition helps re-establish circulation. (*Carry On.*)

As a result of this educational work the entire country is at last awake to the need of preventing disabilities, and when disabilities do occur to the necessity of reclaiming the victims and returning them to a useful existence once more. To-day it is possible to inaugurate reforms which will correct the prodigality of our nation toward human life and human energy.

Prior to this war the army regulations required that all disabled soldiers becoming unfit for full military service should be discharged at once. In other words, following the custom in vogue in many industries, such men were "scrapped" with very little thought, beyond that of pension, being given to their future. In May, 1918,

the reconstruction policy was finally approved by the Secretary of War and since then few disabled soldiers have been discharged until "the most complete physical, functional and mental restoration has been attained, or is possible to attain when the nature of the disabilities are considered."

Several general hospitals have been utilized to carry out the

Fig. 203.—Ward occupations. From the man denied the privilege of going to school in his youth to the one whose college studies were interrupted by the war, academic courses are offered in every hospital. Lessons in left hand penmanship are necessary for many. (*Carry On.*)

intent of this ploicy. In these hospitals thousands of disabled soldiers have been treated, or are now under treatment, always with the view of accomplishing their complete cure or their maximum improvement. Every conceivable type of disability is presented including many cases with multiple disabilities. They can be grouped under the following classes according to their frequency: (1) The neuropsychiatric cases; (2) the tuberculous; (3) the orthopedic, including amputation cases,

and the deformities following infections, scar contractures, certain fractures, etc.; (4) the cardiovascular; (5) the general medical and surgical cases; (6) the blind and the deaf.

The neuropsychiatric patients have been segregated in a center consisting of a hospital and barracks. Here it has been found that discipline, work, play, exercise, hydrotherapy and intelligent handling combined with constant effort to improve their morale has been the best means of restoring these soldiers to the point where they could be discharged.

The tuberculous have been sent to special sanatoria and, in addition to the routine treatment, schools and shops have been provided where these patients could receive the benefits of work and study as soon as their conditions permitted. Play, work and physical drills

FIG. 204.—Forty-seven large army hospitals are now carrying on physical reconstruction.

have been found the most excellent adjuncts toward hastening the cure of these soldiers. As far as possible the work has been made practical with a view of improving their future economic state. Instead of seeing the typical group of hospitalized tuberculous patients one finds here an apparently healthy group of young men engaged in many different activities. Their morale is good and as a general rule they are anxious to remain until cured.

Many orthopedic cases are under treatment at Walter Reed Hospital. The patients with amputations, between six and seven hundred at present, are fitted as soon as possible with their artificial appliances. For a certain period every day each patient receives some form of physiotherapy such as massage, special exercise to facilitate motion of the stump; also occupational and mechanotherapy, and special instruction

in the use of his artificial member. As soon as his general condition permits study and work begins in the schools and shops adjacent to the hospital. Excellent educational facilities have been provided not only for these cases but for all other convalescents. There are primary classes for the illiterates, higher grades for the others who were never permitted to complete their education, and college courses

FIG. 205.—Tuberculous patients at work in the garden at U. S. A. General Hospital No. 16, New Haven, Conn. (*Carry On.*)

for the boys who quit the universities to go to the front. Shorthand, typewriting, bookkeeping, telegraphy and many other commercial courses are available. Those who have lost their right arms are soon taught to write with their left.

In the shops these amputation cases, patients with deformities, and many other types of convalescents receive work which will hasten their functional restoration and at the same time return them to better

FIG. 206.—Training disabled soldiers in art work and sign painting during their convalescent days exemplifies the efforts to attain an economic end-result.

FIG. 207.—Motor mechanics and other forms of shop work hasten the restoration of function and will return many disabled soldiers to better jobs in civil life.

jobs in civil life. The various illustrations give an excellent idea of these different therapeutic adjuncts which help in the physical reconstruction of these disabled soldiers.

In all the general hospitals where the different types of special cases are collected some form of occupational therapy, curative work and study and a certain amount of vocational education is being given.

The re-education of the blind soldiers forms one of the greatest examples of combining medical and economic treatment. Previous to the war there were some 10 or 12 trades and professions that the majority of blind people entered in order to eke out a livelihood, for example broom making, piano tuning, basketry, etc. As a part of the plans for the blind soldiers' future, industrial engineers, working under the direction of Lt. Colonel James Bordley, have made extensive surveys of many different industries and have already found 208 different occupations which these men can perform after a certain amount of training. Men blinded in industry in the future should have a much happier existence than has usually been afforded them in the past provided this lesson is driven home (Fig. 208).

Fig. 208.—Training the blind. Typewriting is taught to all blind soldiers. By use of the dictaphone some become expert office men. (*Carry On.*)

When the physical reconstruction is completed these variously handicapped soldiers are discharged. The compensable cases whose handicaps make it necessary to learn a new trade or profession, and even those who can be made more useful citizens, and desire the opportunity, are placed under the Federal Board of Vocational Education to whom Congress assigned the duty of completing the vocational rehabilitation of disabled soldiers. This board is using as far as

possible the existing civilian machinery to complete this phase of the work. Trade schools, colleges, and all kinds of industries are throwing open their doors to these soldier boys.

By co-operating with the Department of Labor all reconstructed soldiers are being placed back into industry. Supervision to see that their rehabilitation is completed and so remains devolves upon the War Risk Bureau and the Federal Board. The Civilian Relief Division of the American Red Cross is giving valuable assistance in this stage of the work.

The problem of the disabled soldier is being solved. Our greatest efforts must now be directed to secure the same benefits for the disabled from industry.

PHYSICAL RECONSTRUCTION IN CERTAIN INDUSTRIES

Several industries with comprehensive systems of industrial medicine and surgery have been practicing the best form of reconstruction of the disabled for many years, although their work was not so designated. In fact the medical staffs of these concerns have developed a more practical co-ordinated system of reconstruction than any yet devised by our government or any of the other nations in this war.

The terms *conservation* and *reclamation* more clearly define the scope of these efforts in industry than do the terms *physical reconstruction* and *rehabilitation.*

But, whatever expressions are used to designate this work, the desired results can only be attained by a completely rounded out plan similar to that adopted in these industries. It includes: (1) Prevention of disease and accident; (2) constant health supervision; (3) adequate medical and surgical care for all disabled; (4) proper selection of work according to the physical qualifications of each individual, including properly chosen new work for the handicapped after his recovery; (5) practical vocational training in the plant for new occupations when the disability prevents return to the old job; (6) and sufficient compensation for the disabled man and his dependents to live on while he is undergoing reconstruction.

Thus those surgeons in industry who have returned the disabled employees to light occupations as soon as possible in order that the work could help restore the function in the injured member, and also to assist the employee to regain a proper mental balance once more, have been practicing the best type of physical reconstruction. Or what better example of reconstruction can one find than that of the industry which sends its tuberculous employee to a sanatorium until his disease is arrested and then allows him to return to selected work in the plant, under careful medical supervision, until his disease is cured and he is fully restored as a useful member of society once more?

When a man loses his arm or some other member and is unable to return to his old job many of these concerns give him an opportunity to learn a new and better occupation instead of relegating him to the scrap heap, or to a medicore position such as a watchman. Even employees who develop heart disease, or some other permanent handicap the result of disease, are often trained for new jobs where they can still be efficient without further jeopardizing their health.

A few industries, through the efforts of their medical staffs have acquired this humane attitude toward their disabled employees. Certainly no better demonstration of practical vocational rehabilitation can be found.

Therefore, industrial medicine, as conceived and practiced by some, can claim the honor of pioneering in this field of reclamation. Without the war many years would have elapsed before these ideals would have received general recognition. But as a result of the war the entire medical profession, industry and labor and society in general are enthusiastically grasping this new principle—the physical reconstruction and rehabilitation of disabled men. This is the psychological moment in the history of our nation to extend this great work to every employee, yes, to every individual throughout the land.

The Usual Method in Industry

Unfortunately only a relatively small number of industries have the enlightened viewpoint above described. The majority of our employers, great and small, still consider the human machine as something to use to the utmost for gain; to conserve its powers is not their responsibility. Thus in spite of the great efforts to establish disease and accident prevention, adequate medical and surgical care and various reclamation methods we still have and will continue to have, the disabled employee in our midst. The man who is no longer able to continue at heavy work because of a damaged heart or circulatory apparatus; the man who develops tuberculosis, and, even though cured, is afraid to or advised against returning to his former occupation, or is rejected from one job after another because of his damaged lung; the epileptic who, to safeguard the concern against possible compensation, is fired as soon as his condition is known; the men with hernias, with flat feet and many other anatomic conditions that make them inefficient, as well as the armless and legless and others seriously handicapped, the result of injuries; all make up our army of disabled men. Every year adds to the total of incompetents who, on account of disease or accidents, are prematurely thrown on the scrap heap because their handicaps prevent them from continuing at their old occupations.

As already stated a few industries salvage these disabled and

make them efficient and independent. Some industries give these employees easy jobs where they can make a living. But the very softness of the job robs them of all incentive, and the bitterness engendered from dying ambition adds to their incompetency, so that many of these drift on into the scrap heap. Other concerns settle with their injured workmen when they are legally responsible and then dismiss them. Their disabled, for whom they are morally responsible, are scrapped without a settlement. These men, trained for certain occupations, who meet with permanent handicaps, are the waste products of our industrial life. Too often when employed, they are ineffective because they are thrown into the job without considering their physical fitness for it. Again they are given the positions of watchman, flagman, messengers, porters and similar work when, with proper training, their full mental energy and remaining physical capacities could make them highly efficient in much more gainful vocations.

The most unfortunate group of disabled men are those who cease to be employed by the concern responsible for their disability. Other employers are not interested in them, do not feel responsible for them. They drift from one job to another, constantly dropping to a lower scale, until finally they relinguish all effort to work. These make up the loafers, the beggar on the corner, the shoestring merchant on the street, the poor physical handicapped and mentally debased flotsam and jetsam of our civilization.

Size of the Problem

In the army several million dollars have been set aside for the reconstruction and rehabilitation of the disabled soldiers, on an estimate that there would be approximately 50,000 of these men each year of the war needing reconstruction and 20,000 of these would need vocational training. Compare with this the meagre appropriation allowed for the reclamation of the disabled employees—the soldiers of our great industrial army, of whom, on the lowest estimate, there are at least 800,000 disabled by disease and accident in industry every year who need physical reconstruction, and at least 200,000 of these need training for new and better occupations. Fig. 209 graphically shows the size of the problem in the army and in industry and its solution.

If the casualty list from industry could be printed every day in our newspapers the people of this country would be appalled at its size. In one year from accidents alone it is over four times as large as the entire casualties among our troops on the battle fields in Europe. We have no record to show the number who are killed or disabled as the result of occupational diseases and diseases partially traceable to working conditions but these undoubtedly are even more shocking.

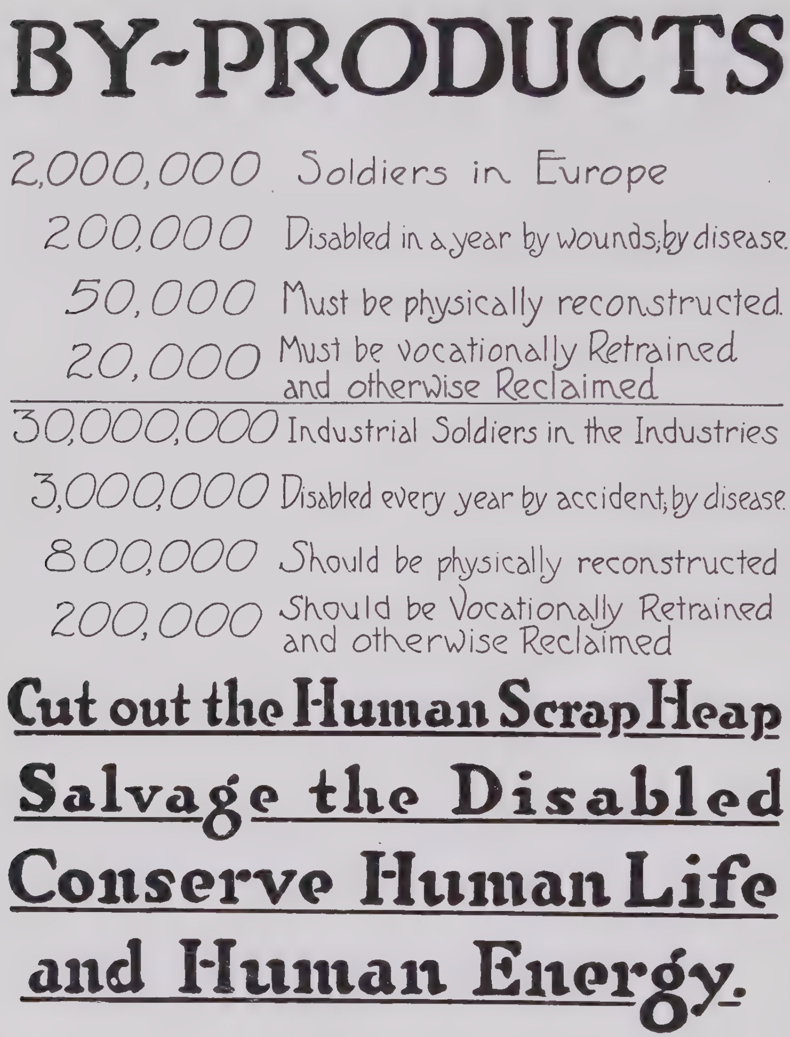

Fig. 209.—Have we met our obligations?

The following figures furnished by the Bureau of Statistics, Department of Labor, are very instructive in this connection:

Estimated number of persons, ten years of age or over, gainfully employed in the United States as of April 15, 1917		44,533,208
Male	34,537,974	
Female	10,005,234	
(Include employees, employers, farmers, and independent workers.)		
Estimated number of industrial accidents in the United States in 1917		903,000
Fatal	28,000	
Non-fatal causing disability of over four weeks	875,000	

Of the 875,000 non-fatal accidents 74,600 would result in amputation or loss of use of some member, distributed as follows:

Loss of 1 eye or reduction of vision to $\frac{1}{10}$	5,700
Loss of 1 hand or arm	2,880
Loss of 1 foot or leg	1,220
Loss of 1 finger or part of finger	52,050
Loss of two or more fingers	9,100
All other specific injuries (including multiple)	3,580
Total	74,600

These figures do not include the great number of accident cases occurring on our streets, such as automobile accidents. These victims, often very poor, are carried into our hospitals, suffer the loss of a leg or an arm and are turned out surgically cured to fend for themselves. Many of these are far from economically cured and make up a large percentage of the dependents in every community.

Two years ago a survey of all crippled individuals in Cleveland, Ohio, was made, the total number found being 4815. Of this number 49 per cent. were under the age of 15 at time of occurrence of disability, while 43 per cent. were between the ages of 15 and 59 years, or during the period of working life. Of this latter group 40 per cent. were due to accident. A similar survey in every community throughout the land would undoubtedly reveal the fact that industrial accidents stand second as the cause of permanent disabilities.

At this time comparison between the casualties from war and the casualties from industry is the most striking means of pointing out the size of our civilian disabled problem. Mr. S. S. Riddle has just prepared a reconstruction bulletin for the Department of Labor and Industry of the State of Pennsylvania in which he makes such a comparison between Canada and Pennsylvania both having approximately the same population. Mr. Riddle most concisely points out the size of this problem and further demonstrates the enormous financial cost resulting from accidents in his state. He says:

"The army of employees remaining in Pennsylvania may be considered as six times as great in number as the army Pennsylvania will ultimately put in the field.

"The casualties suffered by that army of Pennsylvania workers —estimated to average continuously 3,000,000 during the two years and a half from January 1, 1916 to July 1, 1918—amounted to 577,053, including 7575 fatalities, according to accident reports submitted during that period to the Pennsylvania Department of Labor and Industry. An accident report is rendered to the department when a worker is killed, or disabled for a period of two days.

"The number of industrial workers injured in two and one-half

years in Pennsylvania is greater than the army that either Canada or Pennsylvania is sending against Germany.

"In other words, if the number—not the percentage of the total engaged—of Pennsylvanians injured in war equals in two and one-half years the number injured in the industries of Pennsylvania during the same period, every man in an army of 500,000 will be injured once and more than 75,000 men in that army will be twice wounded during those two and one-half years.

"Canada, after four years of war, has had approximately 50,000 men returned as unfit for further military service. That number, of course, does not include the total number of men who have been wounded or sick and who have recuperated.

"A vital factor in a comparison of the disabled in war with the injured in industry is the number of men returned as unfit for army service as the result of disease. Mr. T. B. Kidner former Vocational Secretary of the Invalided Soldiers' Commission of Canada, now associated with the Federal Board for Vocational Education of the United States, in an address on 'Vocational Re-education of the Handicapped and Incapacitated in Canada' as delivered at the Eleventh Annual Convention of the National Society for Vocational Education at Philadelphia in February, 1918, cited a recent official statement made in England, reporting that out of every thousand cases of disablement 547 are cases of disease and 453 are cases of wounds and injuries.

"If that ratio holds true for the disabled soldiers returned as unfit to Canada and to Pennsylvania, it would seem to indicate that only about one-half of the men invalided from war are suffering from wounds—but every man in the list of industrial accidents reported is actually wounded.

"Approximately 1200 of the 50,000 disabled soldiers returned to Canada are 'amputation cases' or soldiers having lost one or more arms, legs, hands, feet, fingers and toes.

"That record may be considered with the statement that in the industries of Pennsylvania, during the period of only two years and a half from January 1, 1916, to July 1, 1918, there have been 3798 industrial 'amputation cases' of workers having lost arms, legs, hands, feet, fingers and toes.

"On the basis of those figures, it may be safe to assume that the total number of amputations suffered by men in Pennsylvania's army in the field of war will be considerably less than the total number of amputations suffered in Pennsylvania's industries over an equal period.

"A table showing the dismemberments and loss of parts suffered by industrial workers in Pennsylvania from January 1, 1916, to July 1, 1918, according to accident reports received by the Pennsylvania Department of Labor and Industry is as follows:

	Eyes	Arms	Hands	Fingers	Legs	Feet	Toes
Year 1916	366	59	105	1,111	111	48	87
Year 1917	432	81	214	749	144	112	81
First six months, 1918	359	46	133	500	69	77	68
Totals	1,157	186	455	2,360	324	237	236

"On the other hand, the amputations in warfare are probably more serious in degree than the amputations in industry. According to the official bulletin of the Canadian Department of Soldiers' Civil Re-establishment for March, 1918, a classification of the amputation cases in the Canadian Army shows that of the men returned to Canada, 328 had lost arms and 723 had lost legs. A further classification shows that virtually twice as many arm amputations were made above the elbow as below the elbow and about twice as many leg amputations were made above the knee as below the knee.

"After almost four years of war, with an army, at present, of between 400,000 and 500,000, Canada's experience shows that less than 50 soldiers have been blinded. It has been stated that the number in the Spring of 1918 was 34.

"In the shorter period of only two and one-half years—from January 1, 1916, to July 1, 1918—there have been 29 workers blinded through accidents in the industries of Pennsylvania. The total number of eyes lost through industrial accidents in Pennsylvania during those two and one half-years is 1157.

"Of the twenty-nine men blinded by industrial accidents in Pennsylvania during two and one-half years, one worker also lost a left hand, one a right arm, and one both hands in the accidents that blinded them. During those same two and one-half years, five workers lost both hands, one of whom also lost one eye; six workers lost both legs; three workers lost both feet; four workers lost both an arm and a foot; five workers lost both an eye and a hand; two workers lost a leg and a foot; two workers lost an arm and leg and two workers lost both arms.

"During the two and one-half years from January 1, 1916, to July 1, 1918, there were 159,659 industrial workers injured in Pennsylvania and disabled for a period exceeding fourteen days. Those workers received workmen's compensation payments as provided by the state law and, in addition, dependents of 4636 workers killed in industry likewise received workmen's compensation payments. The difference between the number of 577,053 industrial workers reported as injured and those receiving compensation payments represents cases where the disability did not exceed a period of fourteen days.

"Workmen's compensation awarded and paid for fatalities in Pennsylvania from January 1, 1916 to July 1, 1918, amounted to $11,539,352.46 of which $1,393,616.76 had been paid to dependents. Payments for disability cases during the same period amounted to $5,378,207.14. The gross total of workmen's compensation awarded and paid in Pennsylvania for fatal and disability cases from January 1, 1916, to July 1, 1918, amounted to $16,917,559.60."

Figures from other states would indicate that considerably over 100,000,000 dollars a year are disbursed in payment of accident compensation claims throughout the United States. One-half this sum intelligently spent by the government in prevention of accidents would reduce the number of persons needing physical reconstruction, and the other half of this huge amount would vocationally train and otherwise reclaim the smaller number receiving permanent handicaps, as well as pay their compensation. It must be remembered that adequate surgical care and proper training will always reduce the number of compensable cases.

No less an authority than Dudley M. Holman, recently President of the International Association of Industrial Accident Boards and Commissions, explains the size of the problem of the permanently disabled worker, and the value of prevention as a means of reducing this problem, in the following words:

"It is a very conservative estimate to state that annually 250,000 workers are, under present conditions, permanently thrown out of employment through accident or preventable disease in the United States alone. These men and women must be supported somehow. Part of them receive whole or partial support under the provisions of the workmen's compensation acts, and while this solves in whole or in part their individual problem of existence, it does so in most states only for a limited period, and after six or ten years of idleness, when their compensation ceases, they are left in a most pitiful condition.

"Yet there are a few of these men and women who could be put back into industry and have a place found for them where they could support themselves in part at least.

"This economic waste caused by the apparently enforced idleness of this vast army of men and women exceeeds $100,000,000 a year of added burden, and amounts to not less than half a billion dollars annually, a figure that is constantly being increased by the addition of a quarter of a million cripples each year.

"Much of this burden is primarily borne by the insurance companies, but they pass it along so that in the end the burden falls on society in general. This waste is a by-product of industrial inefficiency, for by prevention of accidents and disease 50 per cent. of these men and women would never become disabled."

Interwoven with and contributing to the wastage of human life and human energy on the part of industry and of society is the inadequate medical care so often afforded these victims of accident. They are admitted to our wards in the hospital and the immediate treatment or operation is performed properly and well. This is followed by the daily dressing. For the remainder of the day, for weeks and weeks to come, the patient is left to his own devices. Lying there in idleness, with worry and melancholy his chief companions, is it any wonder that traumatic neuroses develop? Satisfied with a good surgical end-result, as usually interpreted, very little thought is given to the man's future economic usefulness. As a consequence efforts to restore

FIG. 210.—A typical scene in the average hospital. Nothing to do but play cards, checkers, or read cheap novels for weeks upon weeks of convalescence. This period should be utilized to improve their future social and economic conditions. Suitable ward occupations will hasten recovery.

function in the disabled member receive only secondary consideration. And when the patient must finally leave the hospital, to make room for other unfortunates, neither the surgeon nor the insurance company nor the responsible employer strive to place him in a position where the best economic end-result can be attained (Fig. 210).

Every surgeon will recognize the truth in the following statement made by a layman, Mr. A. Gwynne James, County Court Judge under the Workmen's Compensation Act, in Bath, England:

"On my circuit the large majority of injury cases arise from accidents in mines and from machinery, and the lack of proper and adequate medical treatment and training is simply appalling. There is

practically no exception to the following routine: On the workman receiving his injury he is sent to the hospital, where he receives the best of treatment, and a limb is amputated or other treatment given, but as soon as it is possible to remove him he is discharged to make room for others. He then becomes an out-patient or goes home. In the former case (the hospital is often some way from his home) he attends a few times for dressings, after which all treatment ceases; in the latter case he is attended by his club doctor, often a young and inexperienced medical practitioner, who has had no communication with those who have treated his patient at the hospital, and these attendances invariably cease in a short time, and from then the injured man has 'to fake for himself.' He cannot in most cases carry on his former trade and has no means of being trained to another. As regards artificial limbs, although I have had hundreds of cases before me involving loss of a limb, I have never known a case when an artificial limb has been supplied except the old-fashioned leg stump. The workman does not appreciate or understand the advantage of an artificial limb, and, if he did, has not the means to buy one. Of the cases which come before me perhaps the most numerous and difficult to deal with are those accidents which result in a permanently stiff limb. The insurance company asks the judge for a diminution of payment to the workman on the ground that if he had followed the doctor's advice the limb would not have become stiff, and, therefore, the incapacity to work arises from the negligence of the workman. The treatment advised is generally massage and certain manual exercises; the former (in most cases) the man is totally unable to obtain, either because there is no one living near him who can administer it, or because he has no means to pay for it; as regards manual exercises there is no institution where they can be given and where he can be instructed, and if he tries to exercise the limb himself this involves in most cases very considerable pain, especially to begin with, and the exercise is discontinued. This, in the case of a poor and ignorant man, cannot be held to be negligence, especially as the doctor invariably admits that had the patient been a well-to-do one he would have advised the treatment of exercise being done in the first instance by a medical man. The result is a stiff limb for life, a continuance of weekly payments by the insurance company (probably for life), and a loss to the country of the man's earning powers.

"Another class of case, occasioned by accident arising out of and in the course of the workman's employment, is stiff limbs arising from traumatic neurasthenia. In many instances under proper treatment the neurasthenia need not have developed, and under existing circumstances when it has occurred there is no provision of any kind whatever for medical treatment such as is now given to soldiers suffering from

'shell shock.' I have only dealt with a few instances of the lack of medical and orthopedic treatment of our injured workmen and not with his re-education, although the latter is of signal importance.

"I sincerely trust that the institutions and training which are now being founded for our injured soldiers may become permanent after the war and available to the English workman. As regards the workmen's compensation acts, the law would probably have to be amended by introducing a slight amount of compulsion as regards treatment. I do not think there would be much difficulty as to this; for example, if the workman's doctor and the insurance doctor agreed that a certain treatment was necessary, then if the patient refused to undergo it his weekly payments might be docked or varied.

"Another question would arise in respect of accidents under the above acts as regards the cost of this extra treatment and on whom it should fall. In my opinion this cost should fall mainly if not entirely upon the insurance companies, although in the case of an injured workman having no dependents he might be called upon to pay a small amount from his weekly payments. I cannot think that the insurance companies would make any objection to this course, as the extra cost to them would be more than covered by the smaller weekly payments they would have to pay owing to the increased power of wage earning, and the earlier date at which their liability to make weekly payments would cease. Co-operation and help should be obtained from the Trades Unions, without whose sympathetic assistance the success of the workmen's compensation acts would not have been attained."

Every thoughtful physician and surgeon in this country should be stirred to the utmost endeavor to overcome existing conditions by these eloquent words from the pen of John Mitchell:

"We are casting valuable workers needlessly on the scrap heap. In my experience as chairman of the New York Industrial Commission, which administers the workmen's compensation law, I am brought face to face every day with the tragic consequences of our failure to make some provision for restoring to economic usefulness, self assurance, and renewed interest in living, those victims of industry whose injuries have maimed or disabled them beyond all possibility of returning to their *usual* occupations. . . . For a time workmen's compensation comes to the aid of the family. Then these benefits are exhausted. The little savings of years are swallowed up. The unfortunate man is entirely cut off in the prime of manly vigor from the work he knows so well how to do. He sees no occupation open to him. . . . His special knowledge of working processes gone to waste, he sinks under the weight of his misfortune . . . watching . . . the black shadows of destitution fall over his home."

The Solution of the Problem

The accident cases—the armless, the legless and the blind—form the most spectacular group of those needing physical reconstruction. But those employees suffering from "invisible wounds"—the tuberculous, the heart case, the nephritic, the mental defective and the victims of occupational diseases—demand the same care.

The problem of the disabled from industry can only be solved, however, by considering every angle of *human conservation* and *reclamation.* It involves more than the physical reconstruction and vocational training.

Every year recently has witnessed the enactment of laws by the different states tending to meet some portion of this problem. But these laws show a woeful lack of intelligent understanding of the exigency and are very inadequate. Proof of this statement has just been furnished in the pages dealing with the size of this problem as it confronts us to-day after several years of legislative effort.

The first real advance in labor legislation in this country was the enactment of certain laws regarding industrial sanitation and the establishment of state factory inspectors in practically every state. These have been followed by acts concerning hours of labor, employment of women and children, periodical examinations for occupational diseases and, in 38 states, employees' compensation acts. The Federal government has passed similar laws for the government employees. At present there is a bill before Congress for the vocational rehabilitation of industrial cripples. The trouble with all this legislation and the reason that it has not been more successful is this piecemeal method of meeting the requirements.

Certainly the time is ripe for uniform labor legislation which will adequately solve the problems of conserving human life, reclaiming the disabled, sufficient compensation for disabilities sustained, insurance against sickness, old age, and unemployment, and better living and working conditions.

Instead of Congress enacting another law applying to only a small angle of this great question it would be much wiser for it to appoint a commission, and provide sufficient funds, in order that the whole situation could be studied and a standard law submitted to the Federal and state governments which would furnish a comprehensive solution of the whole problem.

Such a law, couched in simple but unmistakable language, and enacted in every state, must provide for the following:

1. **Prevention of Disease and Accidents.**—All possible methods of preventing *occupational diseases* must be standardized and their use made compulsory.

Protection of fellow employees from communicable diseases, in-

cluding the discovery of such diseases, must be provided, as well as adequate supervision of health in order to detect all disease in its incipiency.

The effective accident prevention measures now being used in many industries must be applied to all.

Provisions must be made to include the farmer, the small employer, the employer of domestic help, and every community activity in the scope of this law.

Above all it must provide for better living and housing conditions, better working conditions, shorter hours of labor and better wages so that "the gaunt spector of poverty will be removed from the doors of those who toil, and will give to them a part of the day for rest and recreation in order to repair the bodily wastes that sap the energy and consequently reduce their output through fatigue and overwork."

2. **Adequate Medical and Surgical Care.**—It must provide for the best and immediate medical and surgical care for every sick or injured employee. Whenever occupational conditions are responsible for the sickness or injury the employer should furnish this care.

Adequate care must be clearly defined and must include every therapeutic adjunct which will enable the physical reconstruction, the functional re-education and the maximum restoration to useful employment of every disabled individual.

State and community hospitals, convalescent centers, and human repair shops must be provided where this treatment can be furnished under proper environment and supervision.

Suitable artificial appliances and training in their use must be considered a definite part of treatment. No longer should such an important branch of medicine and of social economy be left to the uncontrolled commercial interests of the country.

3. **Training and Employment.**—The recent provisions for the vocational rehabilitation of disabled soldiers and sailors and their return to civil employment must be extended to the disabled in industry.

Centers must be provided in every state where disabled men made unfit by disease or accident for their usual vocations can be retrained for useful employment.

Federal, state and local employment agencies must be provided for the intelligent placing of these men in suitable occupations.

Employers must be required to train their disabled employees for better or just as good positions as they formerly held instead of relegating them to the usual jobs for cripples such as watchman, messengers, etc.

4. **Compensation and Insurance.**—Thirty-eight states have already enacted employees' compensation laws. None of these covers

all employments; the amount of compensation paid for disabilities has a very wide range; and the methods of insuring the risks and administering the acts differ materially in the various states. The crying need is for a uniform, standardized compensation law in every state.

Insurance against sickness, accidents, invalidity, unemployment and old age must be provided as a definite part of a conservation and reclamation program.

5. **Machinery for Carrying Out the Act.**—Each state should have a central administrative body with sufficient administrative and police powers to execute the intentions of the Act.

Health, sanitation, food, housing, employment, education, insurance and both industry and labor should be represented on this central commission. As far as possible these should be removed from the appointive realm of politics and should be considered honor positions. The activities of the different state departments should be co-ordinated so as to avoid the present duplication and inefficiency existing in the Federal and state governments.

Qualified medical men and laymen must be appointed to supervise every angle of this work including even the medical and surgical treatment afforded the disabled, the type of health supervision maintained, as well as the living and working conditions of all coming under the Act.

6. **Remedial Measures for Existing Conditions.**—Laws requiring compensation for injuries without providing for accident prevention have proven how wasteful partial legislation to meet a given situation can be. Therefore, remedial legislation for the purpose of removing or correcting all things which prevent the complete fulfillment of the proposed law is essential.

No longer should inadequate medical and surgical care be tolerated or protected by the unwritten laws of the profession generally included under the term medical ethics.

Those hospitals notorious for their lack of high standards and responsible for many a case of permanent disability must be abolished.

Patent medicines, fake appliances, and quackery of every form, acting as a snare and delusion for millions of employees, must be eradicated.

Child labor and every other form of exploitation of labor must cease.

Above all such a law must be absolutely just, based upon the rights of both industry and labor, and tending to weld into a close partnership those who employ and those who must work. The new viewpoints gained from the sacrifices of this war must lead our country into a true democracy with equal rights for all.

It is not to be expected that these great social, economic and industrial problems will be solved immediately. Great progress has been made during the short time we have been in the war. But years of effort, propaganda and example are yet required before these ideals can be attained. With immigration ceasing to a large extent and with the increased demands upon our industrial resources it will be necessary for the nation to conserve its man-power if we intend to maintain America's economic supremacy and to take our rightful place in the great commercial struggle confronting the world.

Industrial medicine has already blazed the trail in this the greatest conservation movement ever inaugurated. It has played a most important part in helping win the war by maintaining the health and efficiency of our second line of defense—the industrial army. It must now forge ahead, extending its principles to every industry in every community of the land. It must now become the pioneer movement for the socialized medicine of the future.

With a broadened vision and a greater capacity for service let us strive for this ideal—*Human Conservation* and *Reclamation of all Disabled.*

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